Aeronautical Systems Center

Rapidly delivering war-winning capability

USAF Airworthiness Certification

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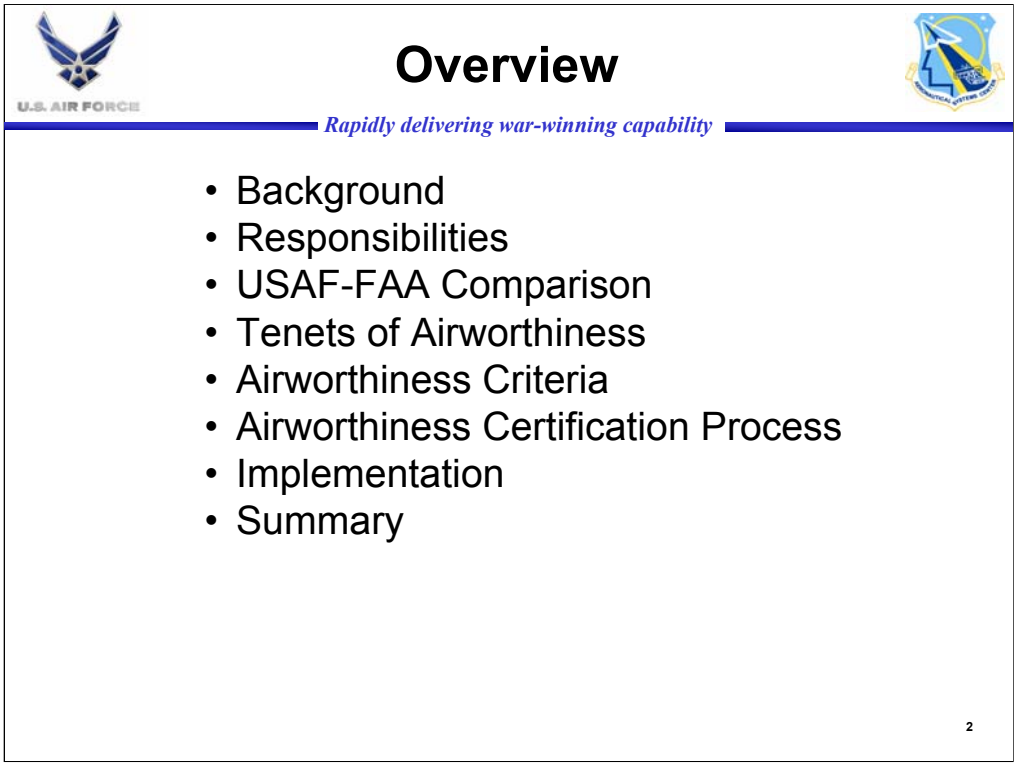
This presentation provides an overview of the airworthiness certification requirements and process.



These topics will be addressed.

Background

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- Airworthiness has always been embedded in the military development and qualification process
- 1993 issuance of Air Force Policy Directive (AFPD) 62-4, *Civil Airworthiness Standards For Transport Aircraft*, strengthened link to Federal Aviation Administration (FAA) begun by Air Force Regulation (AFR) 80-36 in 1973
  - Recognized cost benefit of using commercial derivative aircraft
  - Required adherence to civil airworthiness standards
  - Focus of AFPD 62-4 changed to passenger carrying commercial derivative transport aircraft in 1998
- AFPD 62-5, *Standards of Airworthiness for Commercial Derivative Hybrid Aircraft*, issued in 1998 prefers FAA type certification but recognizes priority of mission requirements and allows mixture of "government approved" portions

Commercial derivative aircraft were the only ones where airworthiness standards were explicitly defined. Adherence to MIL-SPECs and MIL-STDs assured airworthiness of developmental aircraft.

AFPD 62-4
Passenger Carrying Commercial Derivative Transport Aircraft

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- **Procure commercial derivative aircraft where use is consistent with civil operations**
- **Must seek to obtain and maintain an FAA Type Certificate for AF configuration**
- **Operational units must adhere to FAA standards for maintenance to the maximum extent possible**
- **Waiver required for all design features not compliant with Federal Aviation Regulation (FAR) requirements**

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AFPD 62-4 requires commercial derivative passenger carrying aircraft to comply with FAA airworthiness criteria unless a waiver is granted. The SM can request a waiver only "after all possible solutions to resolving FAR issues have been exhausted."

The SM still certifies airworthiness unless the aircraft carries an FAA Airworthiness Certificate.

AFPD 62-5

Commercial Derivative Hybrid Aircraft

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- **Procure commercial derivative aircraft where use is *not* consistent with original design or equivalent civil operation doesn't exist**
- **Preference for FAA type certification except when impracticable or impossible**
- **SM will use Air Force modification procedures when the FARs are inappropriate**
- **Waiver required if aircraft is not in FAA certified configuration when carrying passengers**
- **Use FAA evaluations and inspections to reduce duplicative activities**

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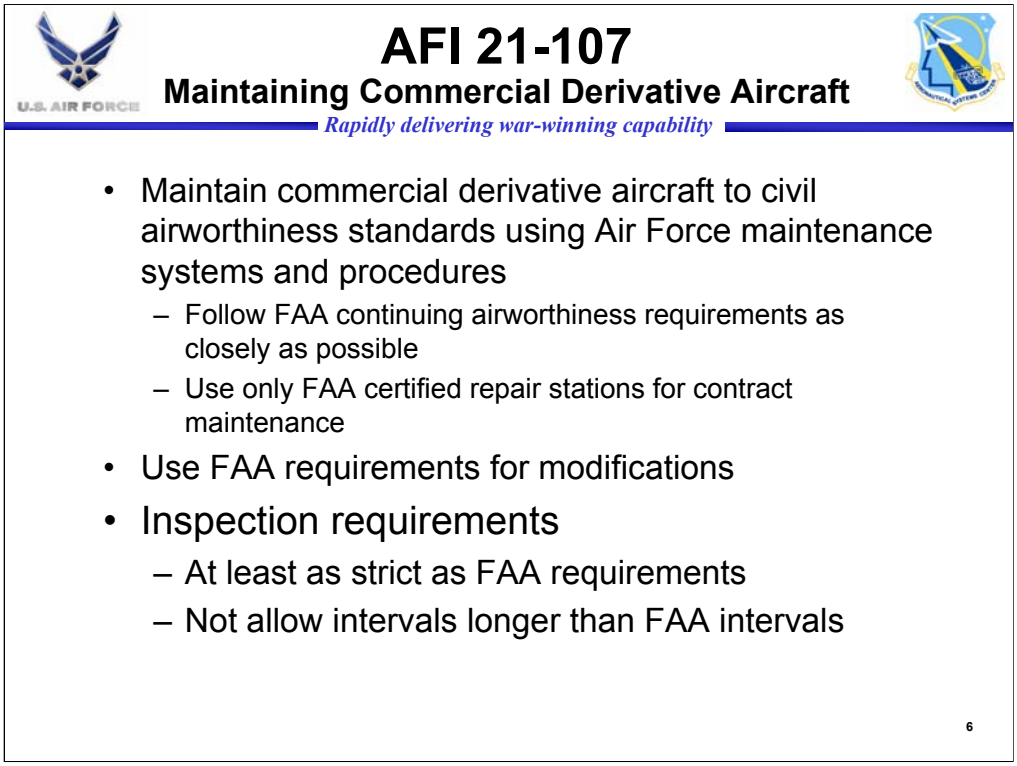
AFPD 62-5 gives preference to FAA airworthiness criteria for hybrid commercial derivative aircraft. It allows the SM to determine how much of the modifications should by FAA type certified (i.e. design approval by the FAA).

The aircraft must be in an FAA certified configuration when it is used for passenger carrying missions unless a waiver is obtained.



This AFI was published on 19 July 1994 as a replacement for AFR 66-26 (26 Nov 1980). Its focus is on commercial derivative transport aircraft and has not been updated to address hybrid aircraft.

Airworthiness Practice for Military Unique Aircraft

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- **Airworthiness was the responsibility of the PEO or SM**
- **No single source for formal guidance on how airworthiness was granted or maintained**
- **And then Acquisition Reform:**
  - **Eliminated center level policies, including first flight airworthiness reviews (Acquisition Lightning Bolt #4)**
  - **Cancelled many military specs and standards which contained airworthiness requirements**
- **Changes resulted in concern for ensuring airworthiness is established and maintained for production and sustainment**

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In our previous environment, the overall airworthiness of Air Force aircraft was the responsibility of the Program Executive Officer (PEO) and Single Manager (SM). However, there was no single source for formal guidance on how airworthiness was granted or maintained. Individual elements of airworthiness were handled through functional responsibilities which had to be integrated within the program office. ASC formerly had a center level policy for first flight approval, but this was cancelled as part of the elimination of center level policies. For military developed aircraft, adherence to MIL-SPECs and MIL-STDs was intended to assure airworthiness of developmental aircraft. Under acquisition reform, many of the military specs and standards which contained airworthiness requirements were cancelled, in part because they tended to dictate design solutions rather than state requirements in performance terms.

All of these changes in the acquisition environment led to significant concern for both establishing and maintaining airworthiness certification of our aircraft.

AFPD 62-6
USAF Aircraft Airworthiness Certification

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- Applies to all USAF aircraft
- Airworthiness Certification Criteria Control Board (AC^3B)
  - Establishes criteria
  - Chaired by ASC/CC, approval authority
  - Broad stakeholder representation
- SM makes and documents a positive determination of SoF prior to first flight
- SM certifies airworthiness prior to dedicated operational test & evaluation
- MAJCOMs/Air National Guard/US Air Force Reserves will prohibit alterations or modifications without SM approval

Allow legacy aircraft SM sufficient flexibility for certification in cost effective manner consistent with safety

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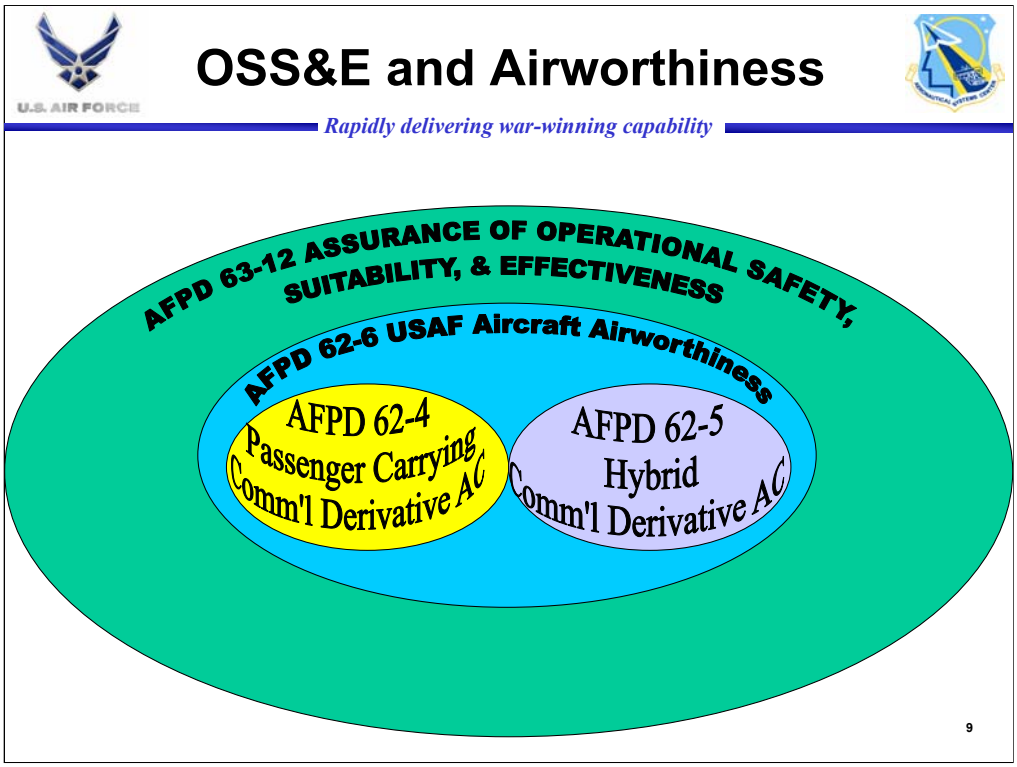
This policy was issued on 1 October 2000.

It designates the single manager as the airworthiness certifying official. It also established the Airworthiness Certification Criteria Control Board. The board is chaired by ASC/CC, who is the final approving authority for the airworthiness certification criteria.

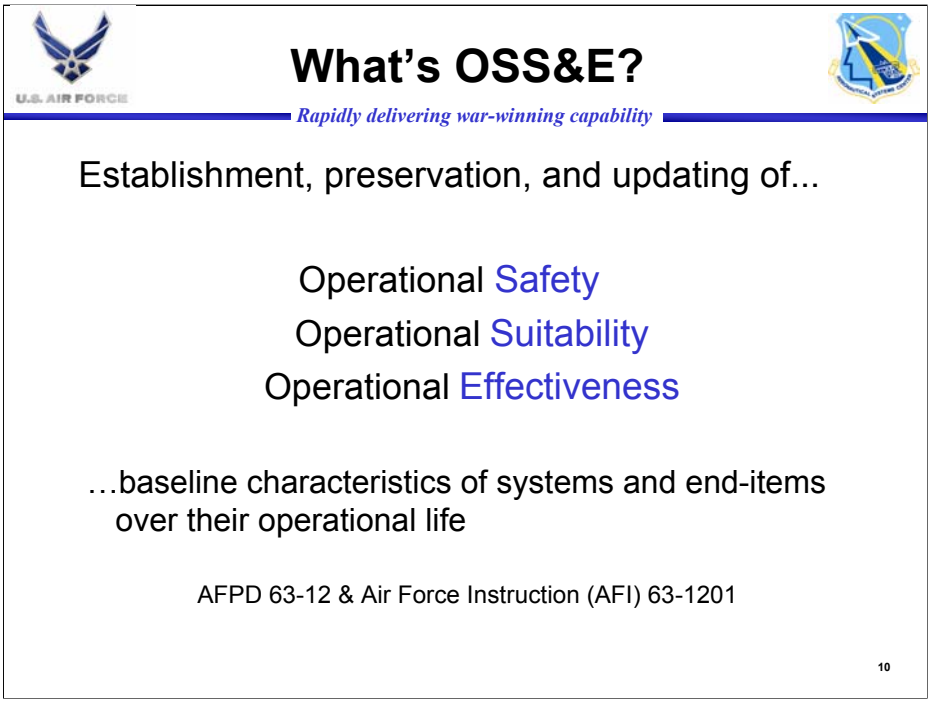
This policy also reinforces the requirement that all aircraft modifications require prior approval from the single manager.

This policy gives the SM of legacy aircraft sufficient flexibility for initial implementation in a cost effective manner, consistent with safety.



Airworthiness certification is one of the certifications that support OSS&E. It is, therefore, a subset of OSS&E.

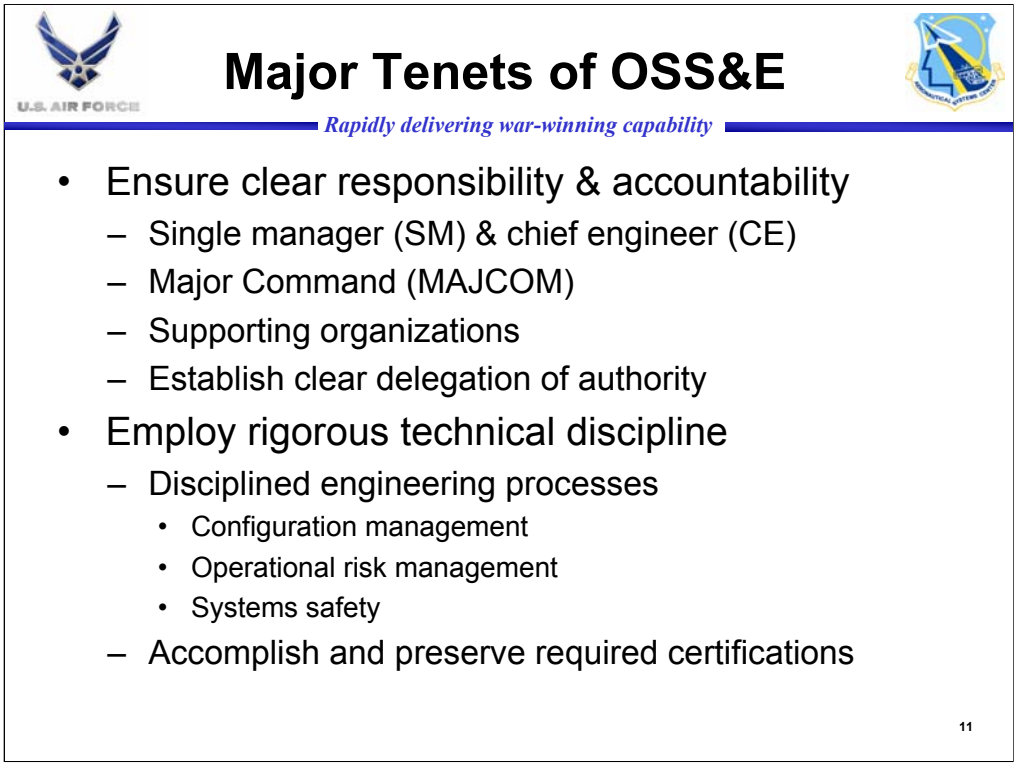
AFPD 62-6 also applies to commercial derivative aircraft. However, compliance with FAA type certification requirements takes precedence over Air Force airworthiness certification criteria, whenever possible.



In it's simplest terms, OSS&E is:

The establishment, preservation, and updating of the OSS&E baseline that controls the key safety, suitability, and effectiveness characteristics of a system or end-item.

OSS&E is governed by AFPD 63-12 and AFI 63-1201.



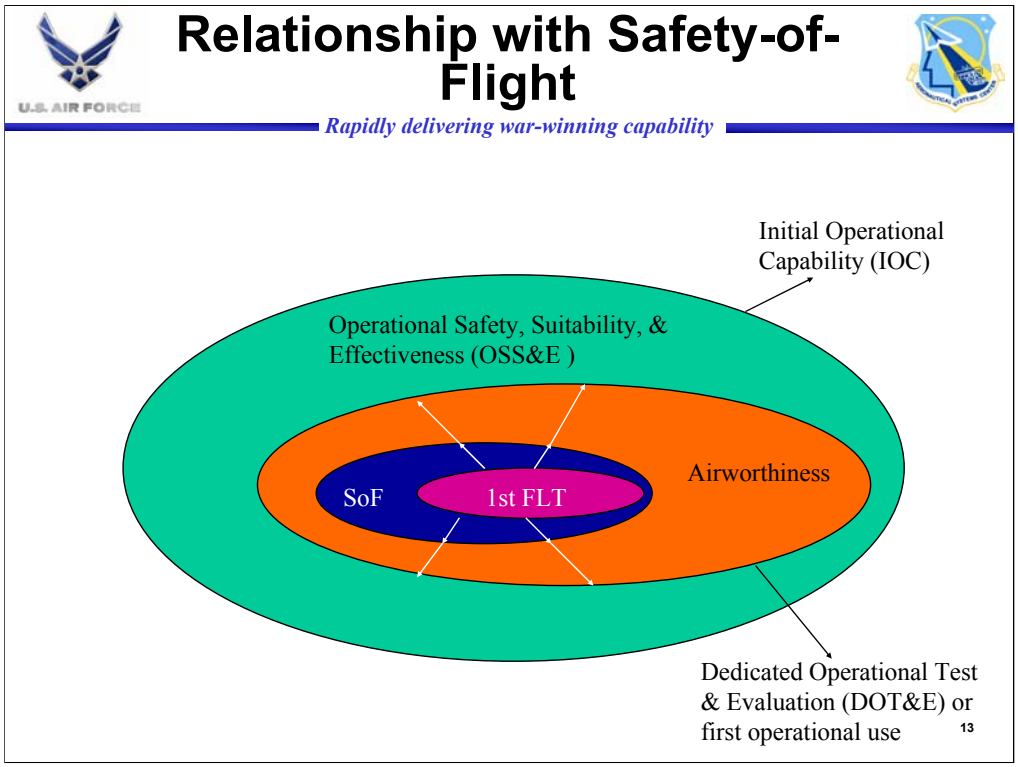
The primary thrust of OSS&E has been to clarify responsibility and accountability, to establish clear lines of authority, and to re-invigorate the disciplined engineering processes during sustainment. Accountability can be delegated, not responsibility.

Airworthiness certification stems from this OSS&E requirement, and is only one of the many certifications required for OSS&E. HQ AFMC has established a goal of full compliance of OSS&E policy on legacy programs by FY05.

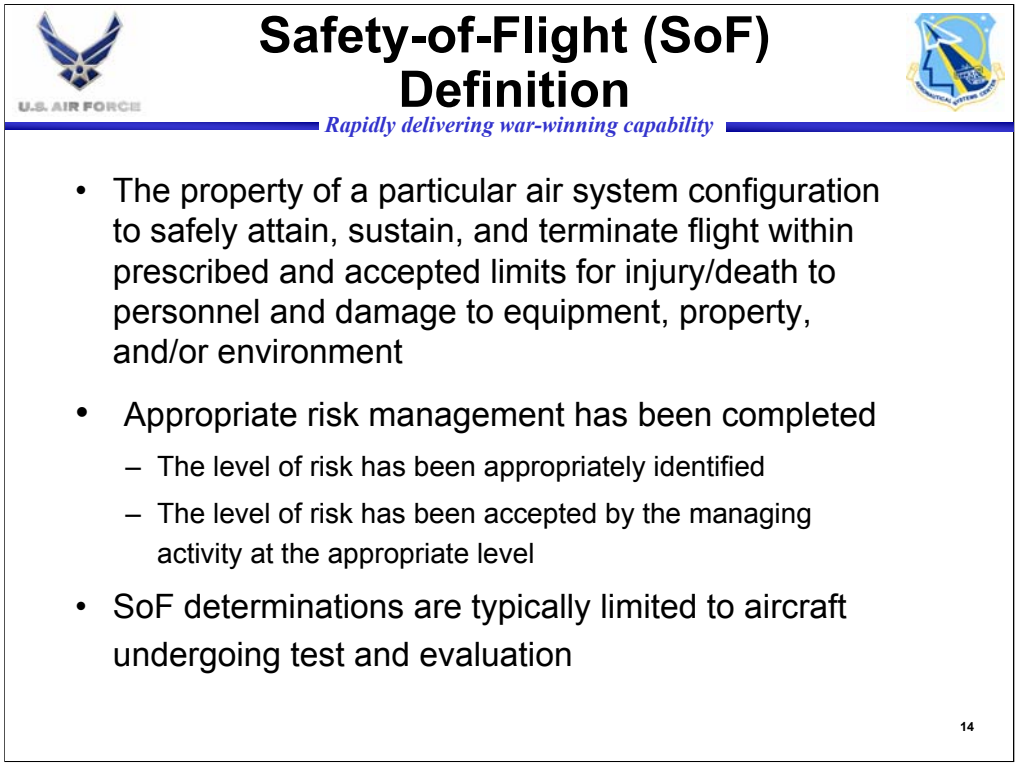
The Engine SPO has implemented airworthiness certification of engines they manage in support of the aircraft airworthiness certification efforts.

The Human Systems SPO's Safe-to-Fly certification is another best practice certification in support of aircraft airworthiness certification.

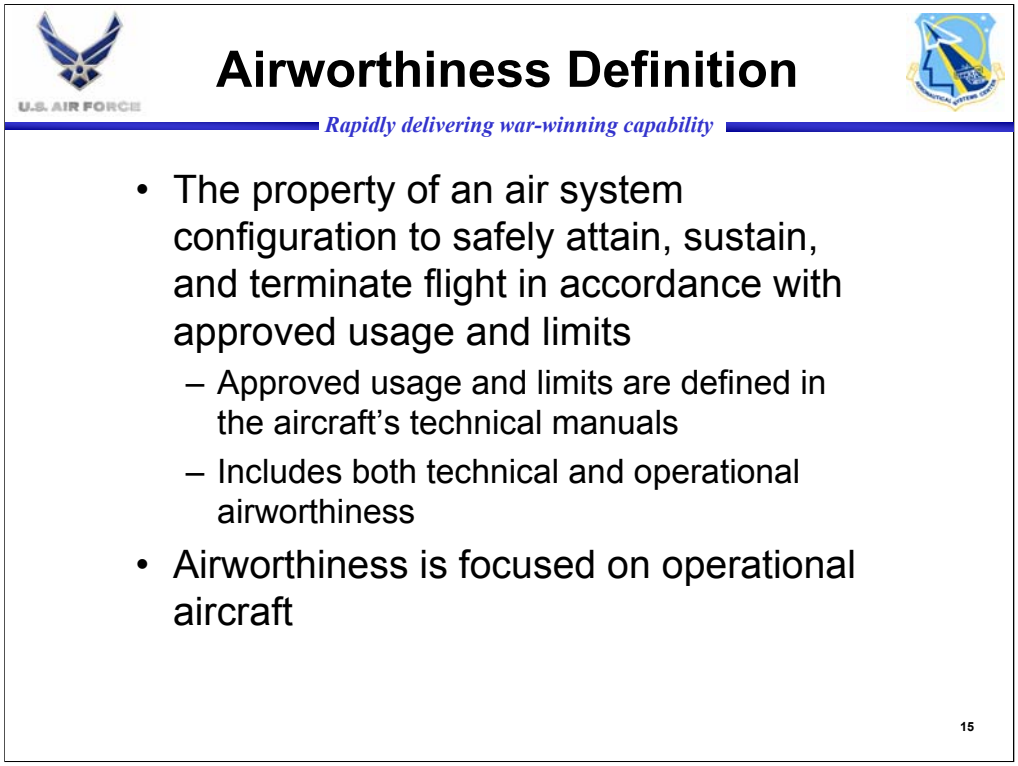
The required GATM and SEEK EAGLE certifications also support aircraft airworthiness certification.



This is an illustration of how airworthiness relates to OSS&E during development of a system or major modification. It is time-based in that you start at the center with a subset of the airworthiness certification criteria for first flight, then move out to verification of an expanded design envelope which constitutes full SoF for all primary functions on the air vehicle. Next, you verify all remaining airworthiness certification criteria as well as the remaining spec requirements. It can then enter DOT&E or first operational use after the SM has certified airworthiness and readiness for DOT&E, if applicable. As you further verify the aircraft's ability to perform its operational mission safely & effectively, you complete sustainment planning for full OSS&E compliance at or before IOC.



SoF determinations generally apply to test aircraft operated in a test environment by flight test pilots under tightly defined, controlled, and monitored conditions, where a greater amount of risk is understood and accepted by the SM. An even greater amount of risk is generally accepted when accomplishing first flight of an air vehicle, and the flight envelope is generally adjusted accordingly.



The SM is responsible for technical airworthiness (AFPD 62-6).

The lead operational command is responsible for operational airworthiness (AFPD 11-2).

Airworthiness Certification Definition

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- A documented decision by the SM that an aircraft system has been judged to be airworthy
  - The aircraft system complies with the criteria established by the Airworthiness Certification Criteria Control Board, and/or
  - The aircraft system carries the appropriate Federal Aviation Administration (FAA) certificates
- Defines technical airworthiness of the aircraft system

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The criteria are define in MIL-HDBK-516, *Airworthiness Certification Criteria*, which is tailored for each aircraft system.

Overview

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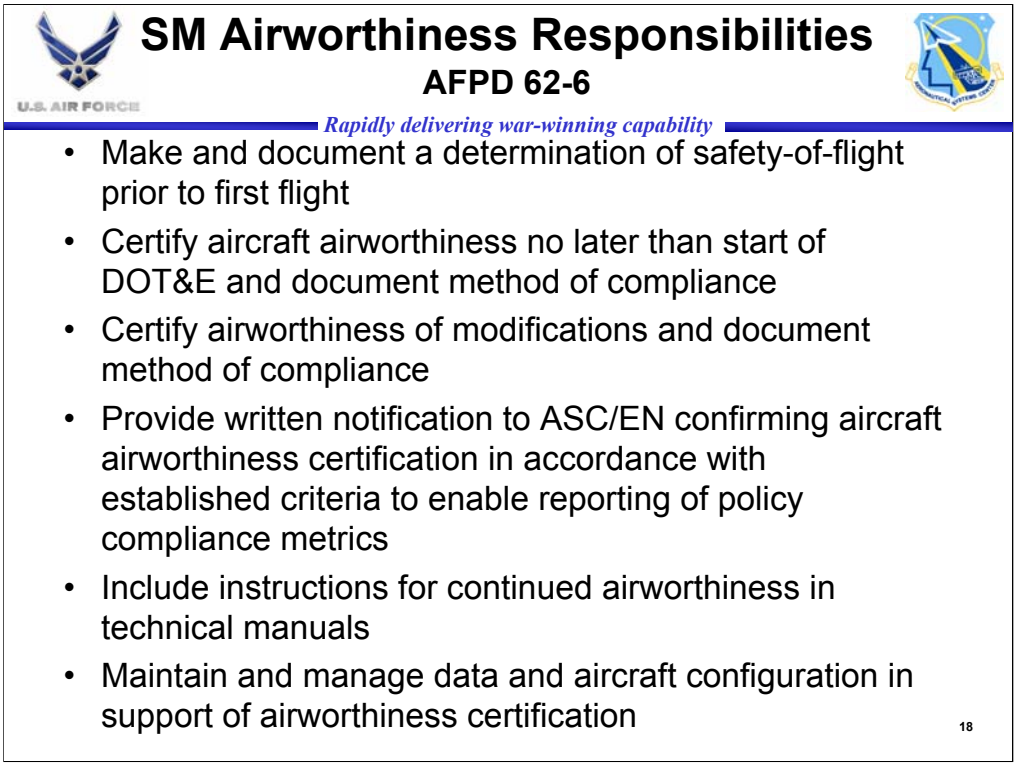
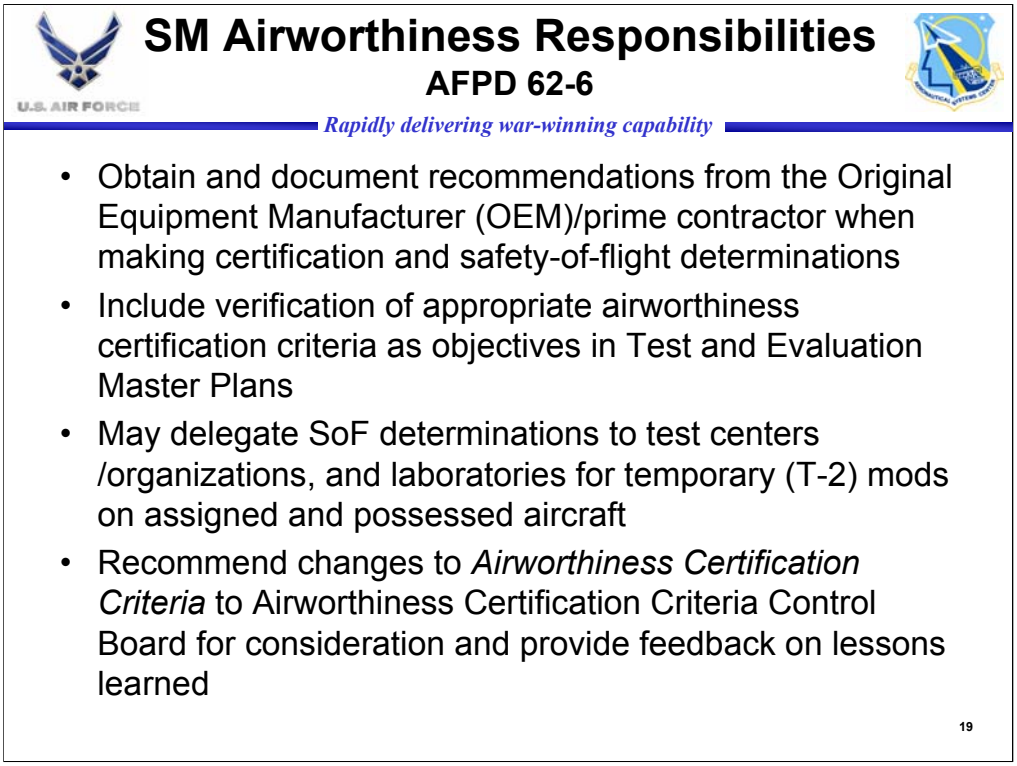
- **Responsibilities**
- USAF-FAA Comparison
- Tenets of Airworthiness
- Airworthiness Criteria
- Airworthiness Certification Process
- Implementation
- Summary

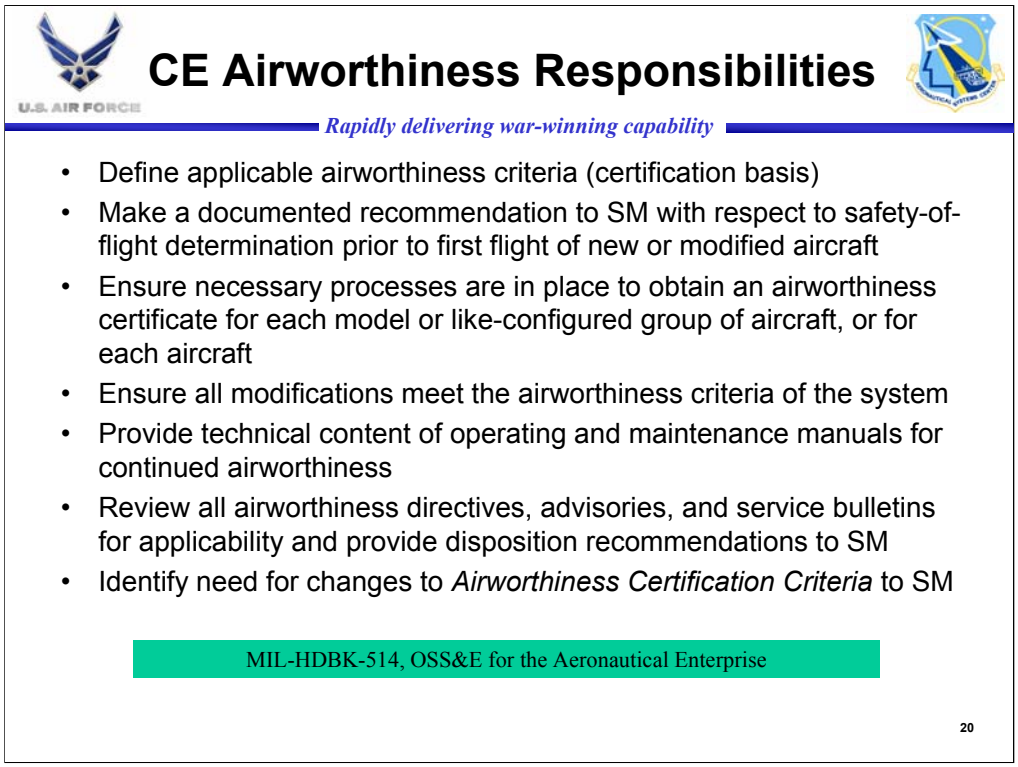


Airworthiness certification must occur prior to first operational use or evaluation if a formal DOT&E won't be accomplished.

Modifications aren't certified by themselves. The aircraft system is recertified after installation of the modification.



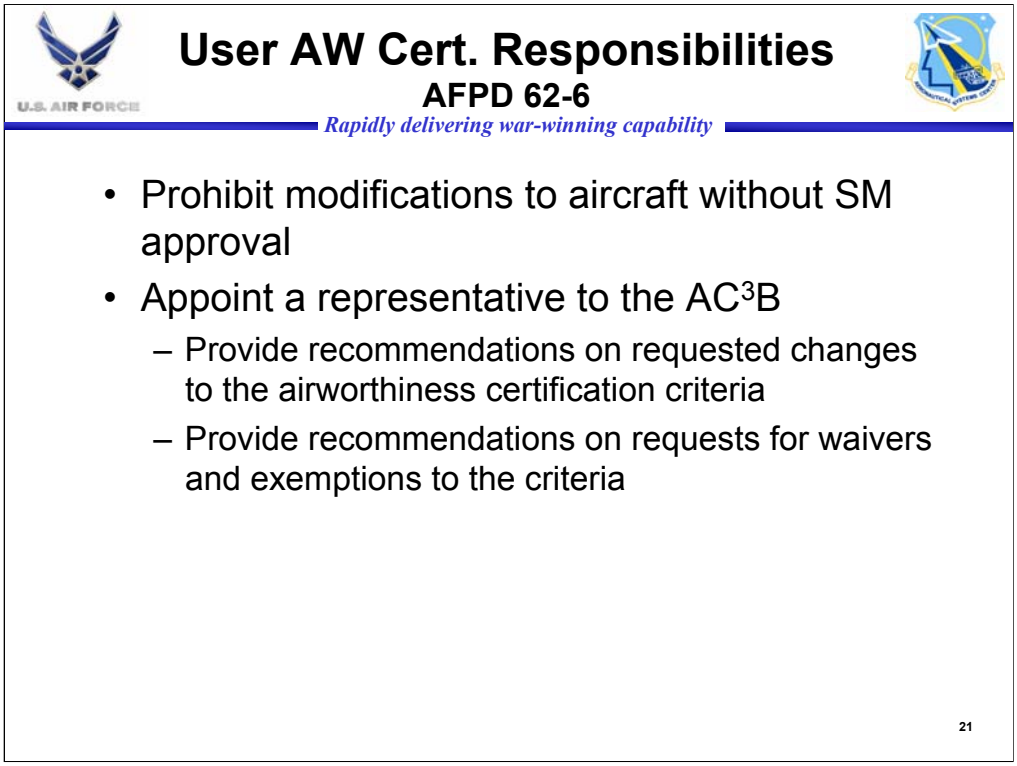
The policy allows delegation only for T-2 modifications, temporary modifications for test and evaluation purposes.



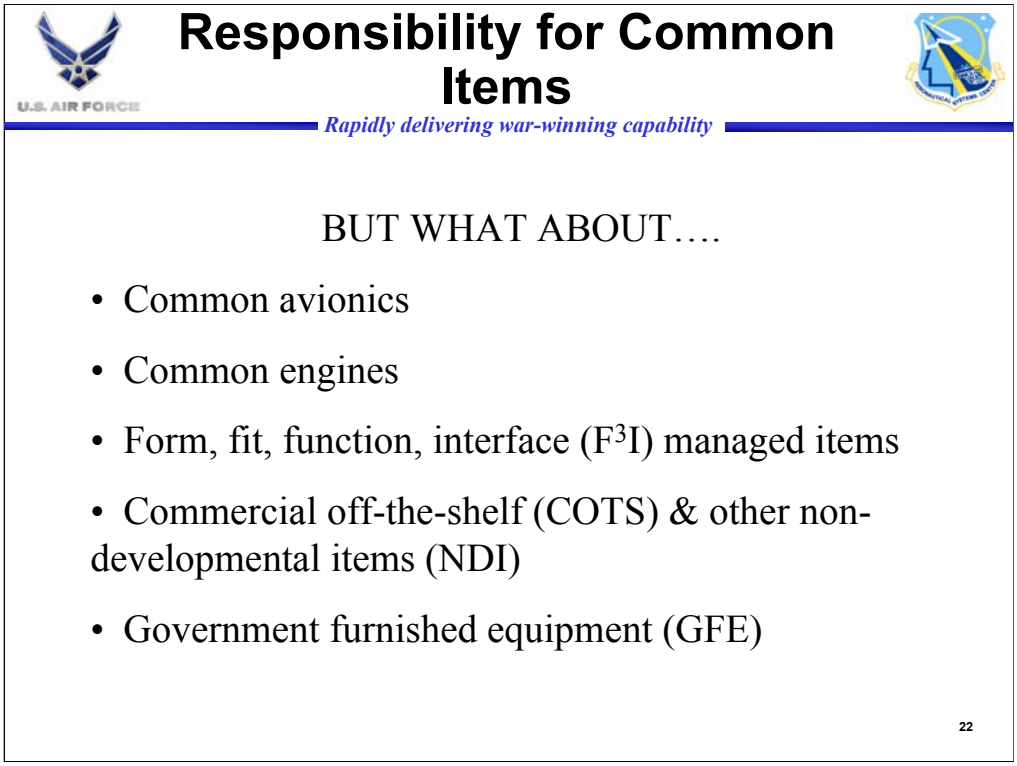
Note that CE/LE responsibilities mirror those of the SM. It is the job of the CE/LE to support the SM for airworthiness certification.

An airworthiness certificate can be provided for the whole fleet, a group of aircraft, or each aircraft.

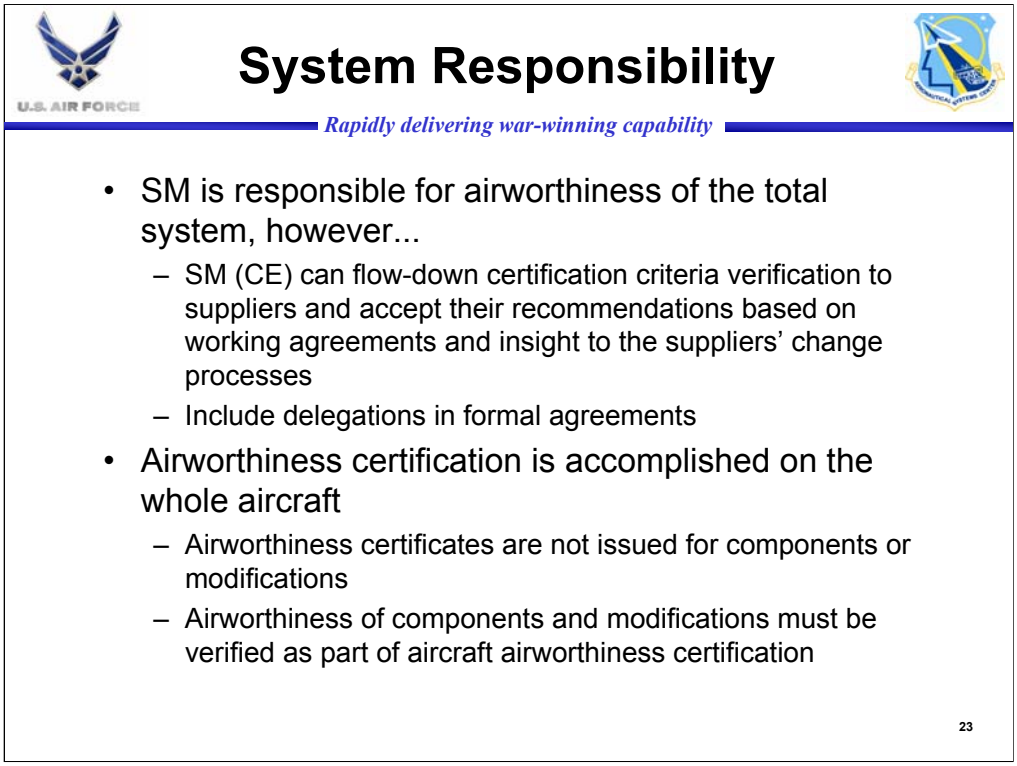
This information comes from *Operational Safety,Suitability,& Effectiveness Assurance for the Aeronautical Enterprise* which is available at http://engineering.wpafb.af.mil/ossande/ossande.asp.



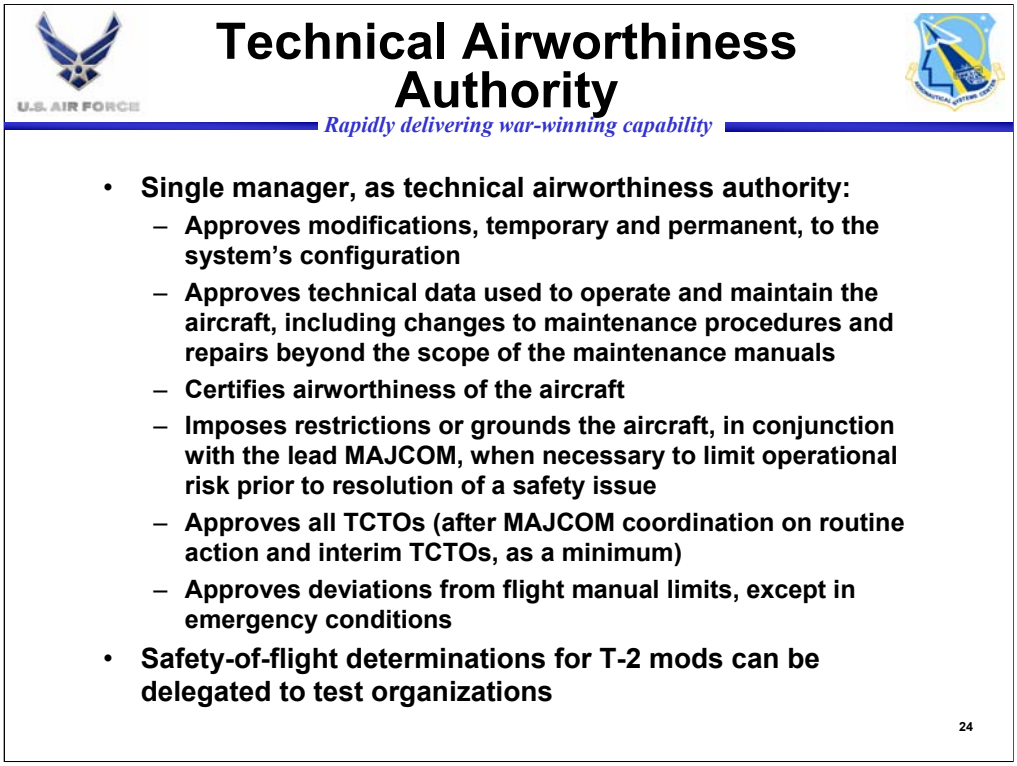
The MAJCOMs have an essential role in maintaining airworthiness certification by ensuring that the aircraft configuration conforms with the SM approved and airworthiness certified design. Each of the lead MAJCOMs, as well as the Air National Guard and the Air Force Reserve Command, have representatives on the AC^{3}B.



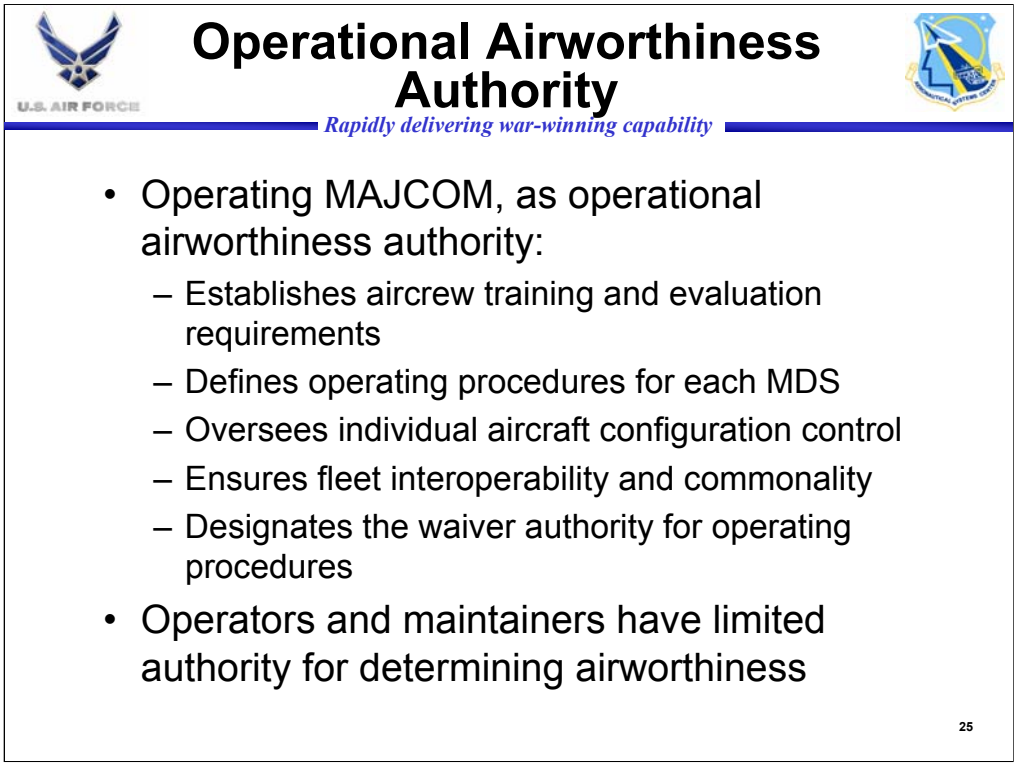
What about subsystems and components that the SM and CE don't have direct control over?



Airworthiness is verified, not certified, for components or modifications. Airworthiness certification is accomplished only at the aircraft level. The aircraft is re-certified after completion of a reportable modification.



These are the primary responsibilities of the SM, as the technical airworthiness authority, as defined in AFPD 62-6 and other Air Force publications. The supporting tasks for these responsibilities are normally delegated to the chief engineer.



These operating MAJCOM responsibilities are defined in AFPDs 10-9 and 11-2 and other Air Force publications.

The maintainers are responsible for maintaining airworthiness of the aircraft within the limits established in the maintenance manuals. Certain maintainers are given the special authority to clear red X conditions, thereby indicating that the aircraft is again safe to fly.

The pilot is responsible for ensuring airworthiness of the aircraft, within the limits established by the flight manual and the operating procedures established by the lead command, before flight.

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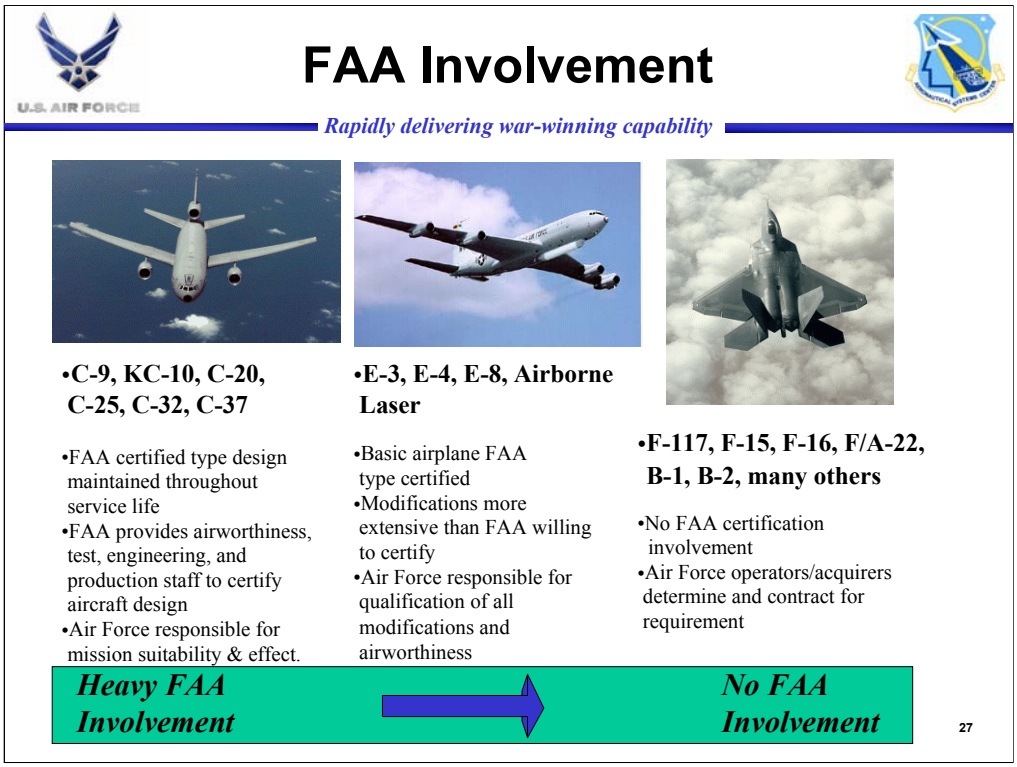
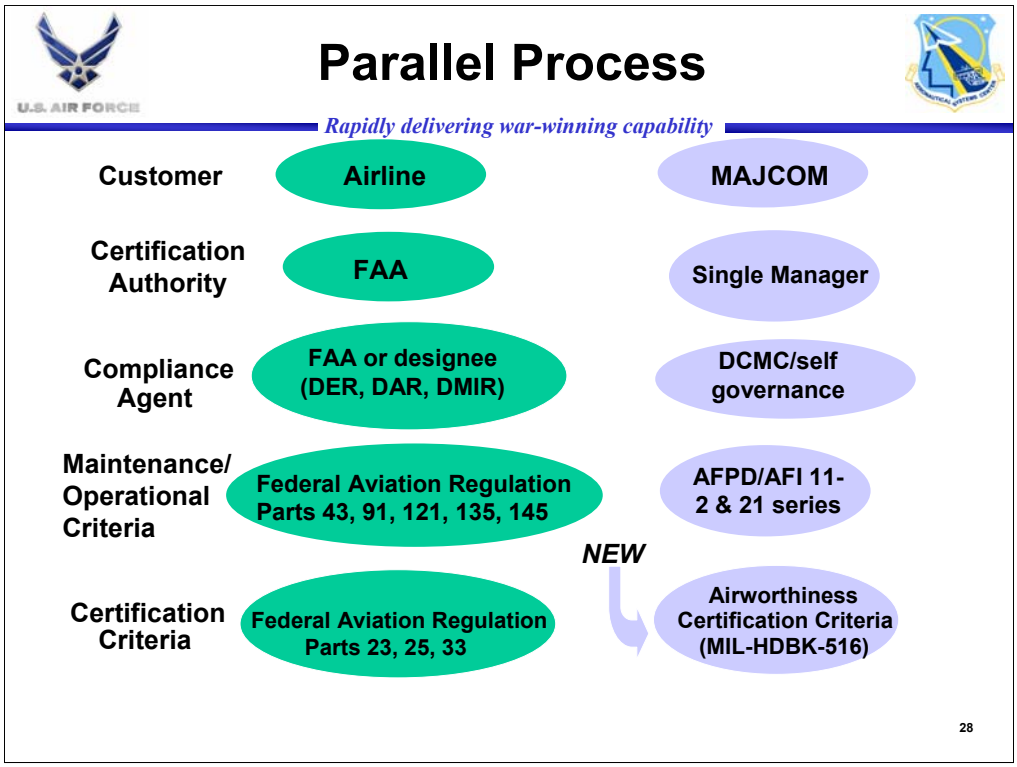


The first column are commercial derivative aircraft that fall under AFPD 62-4.

The second column are commercial derivative aircraft that fall under AFPD 62-5.

Most USAF aircraft fall under the last column and have no FAA involvement in the design approval.

The Air Force is responsible for airworthiness of FAA certified commercial derivative aircraft if the FAA Airworthiness Certificate is not obtained.



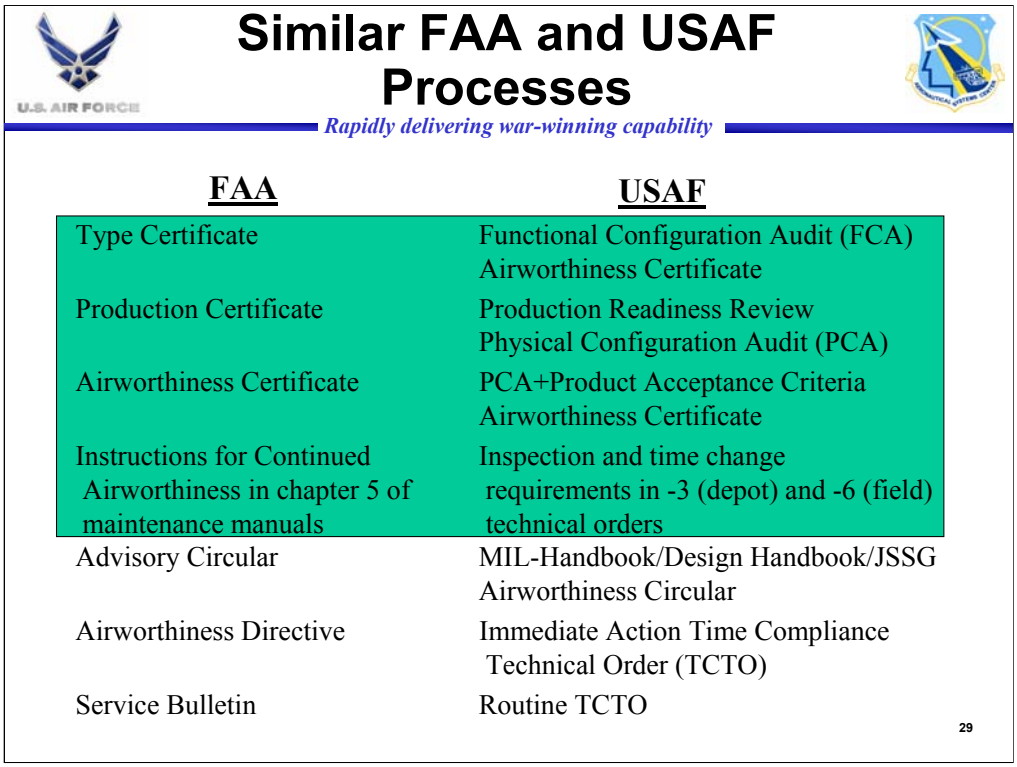
As shown here, there is some degree of similarity and significant differences between the FAA and USAF processes for airworthiness certification.

DER - Designated Engineering Representative

DAR - Designated Airworthiness Representative

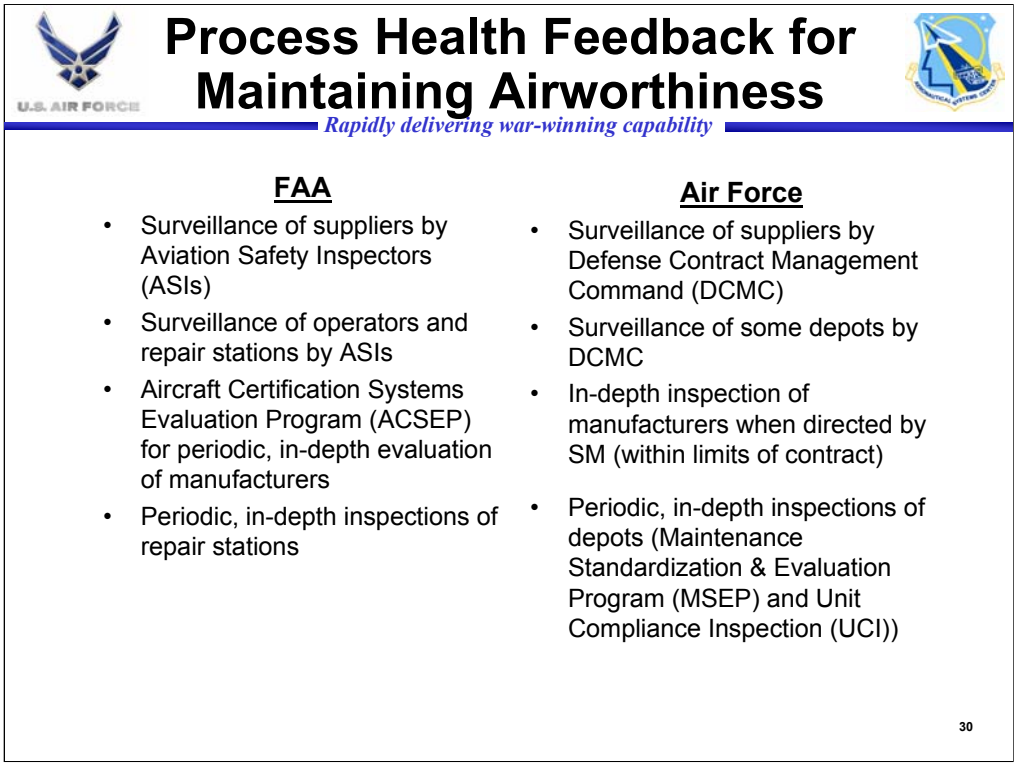
DMIR - Designated Manufacturing Inspection Representative

DCMC - Defense Contract Management Command



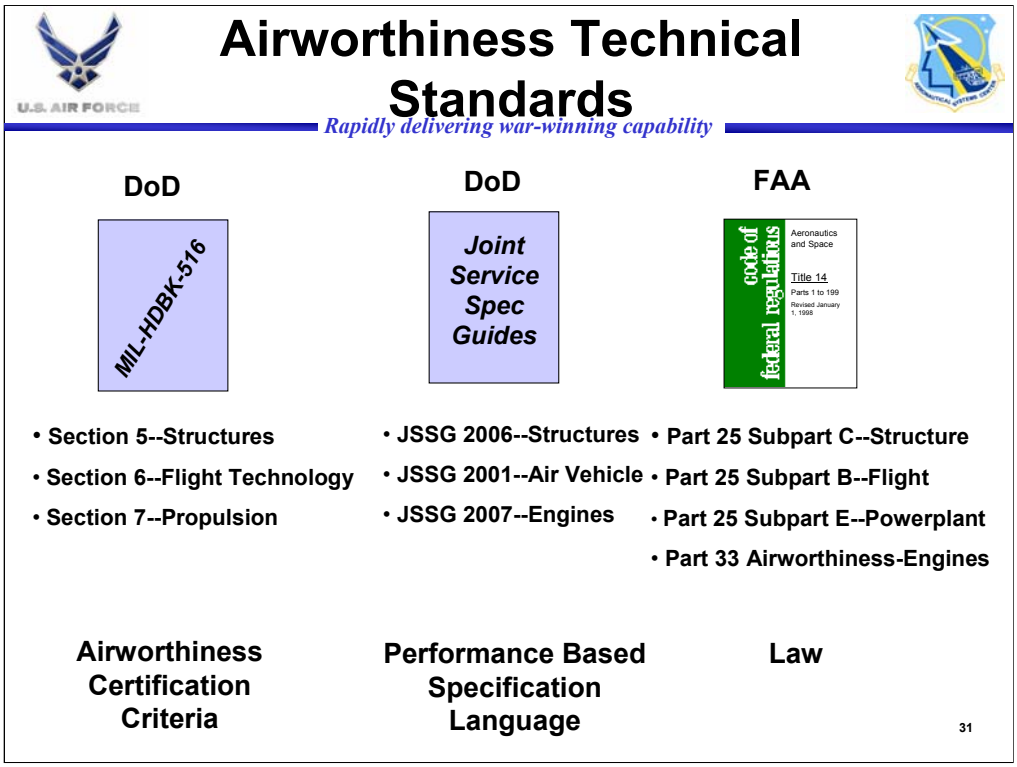
The portion within the box is addressed in the airworthiness certification process. The other items support maintaining airworthiness certification under OSS&E.

JSSG - Joint Service Specification Guide



The first two bullets of each column deal with day-to-day surveillance of manufacturers and major repair facilities. The frequency of the surveillance activities is somewhat based on the quality history of the facility, but it may include in-process inspections of flight-safety critical items.

The last two bullets of each column deal with in-depth inspections of the facilities to verify that the processes are being followed. The breadth of these inspections can vary from a very focused look at a problem area to a very broad look to determine the health of the processes.



There is also some degree of similarity between the structure of MIL-HDBK-516, *Airworthiness Certification Criteria*, and the Federal Aviation Regulations (FARs). However, MIL-HDBK-516 doesn't have the same level of detail as the FARs. It is intended to be used in conjunction with the JSSGs and the FARs referenced in its Appendix to define the airworthiness certification basis for each aircraft type. This will be addressed in more detail later in this presentation.

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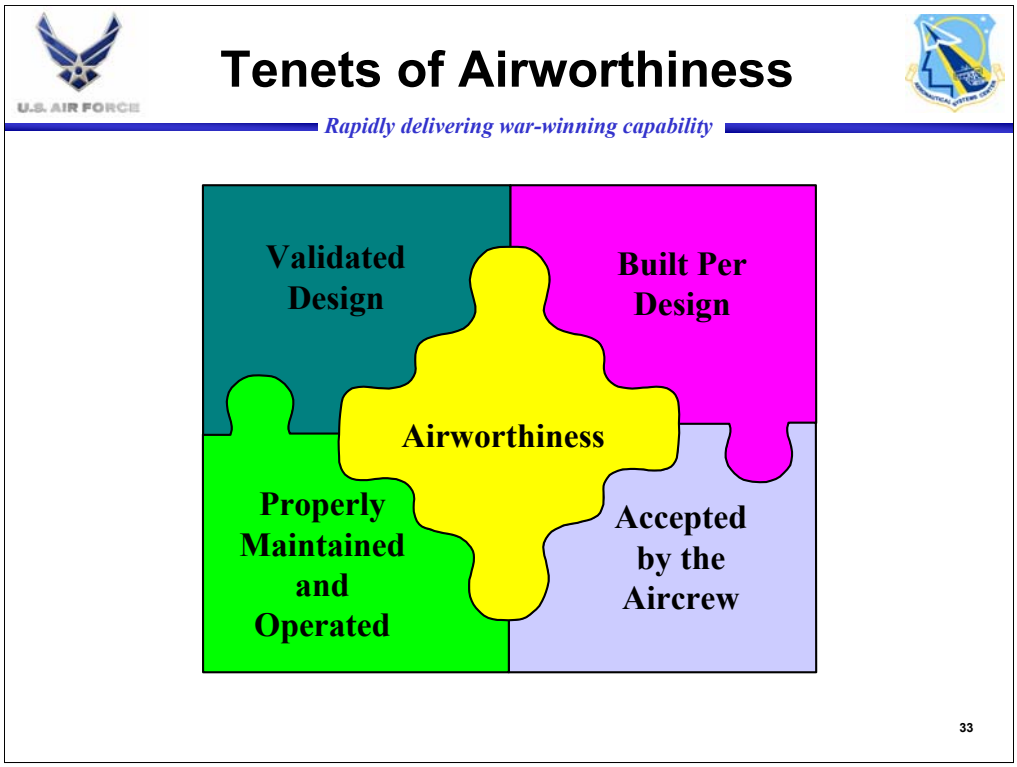

Airworthiness cannot be assured unless all four of these tenets are adequately addressed. The top two tenets are addressed during the airworthiness certification process. The bottom two tenets are essential for maintaining airworthiness and are addressed as part of OSS&E assurance.

Once technical airworthiness has been certified, the system must be operated and maintained in accordance with the technical manuals and all modifications must be approved by the SM in order to maintain the certification.

Tenets of Airworthiness

Validated Design

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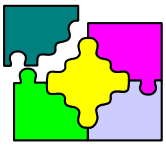
1. Air vehicle design must be proven to meet an approved set of criteria (AFPDs 62-4, 62-5, 62-6, MIL-HDBK-516)
   - The design must comply with the airworthiness certification criteria as tailored by the CE and approved by the SM (certification basis) or have the appropriate FAA type certificates
   - "Proven" means demonstrated compliance with the airworthiness criteria by a means approved by the certifying organization
   - CE has responsibility for ensuring adequacy of compliance methodology
   - Similar to FAA Type Certificate



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Key word is "tailored". MIL-HDBK-516 must be tailored to fit the system by the SM/CE.

AFPD 62-4, *Standards of Airworthiness for Passenger Carrying Commercial Derivative Transport Aircraft*

AFPD 62-5, *Standards of Airworthiness for Commercial Derivative Hybrid Aircraft*

AFPD 62-6, *USAF Aircraft Airworthiness Certification*

MIL-HDBK-516, *Airworthiness Certification Criteria*

Tenets of Airworthiness

Built Per Design

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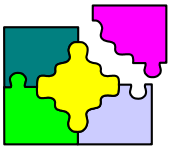
2. The air vehicle must be built in accordance with the approved design (AFPD 63-5, AFI 63-501, MIL-HDBK-516)
   - Design presented for airworthiness approval conforms with the approved physical configuration
   - Critical process capabilities and quality standards exist
   - Production allowances and tolerances are within acceptable limits
   - Similar to FAA conformity and production certificates



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The air vehicle must be built as designed.

For a program in-work or recently completed, the Physical Configuration Audit or its record is a tool for compliance.

The FAA issues an airworthiness certificate for each aircraft after it has been proven to conform with the approved design and production tests and inspections verify its airworthiness.

AFPD 63-5, *Quality Assurance*

AFI 63-501, *Air Force Acquisition Quality Program*

Tenets of Airworthiness

Properly Maintained and Operated

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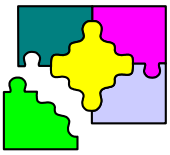
3. The air system must be operated and maintained by qualified personnel in accordance with approved documentation and procedures (AFPD 62-6, Air Force 11-2, 21, and 36 series of policies and instructions, MIL-HDBK-516)
   - A comprehensive set of maintenance and flight manuals are used
   - Failures to flight critical elements are reported to the SM & CE
   - Maintenance personnel are qualified, competent, and properly trained
   - Aircraft records are properly maintained
   - Special procedures required to preserve airworthiness are approved
   - All modifications have SM approval



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MIL-HDBK-516 includes criteria for technical manuals.

Changes to maintenance procedures and repairs beyond the scope of the maintenance manuals require prior approval from the SM.

11-2 Series - Flying Operations

21 Series - Maintenance

36 Series - Personnel

Tenets of Airworthiness

Accepted by the Aircrew

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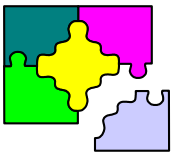
4. The air system must be accepted by the operating crew as being in a condition for safe operation (AFI 11-2 series)
   - Aircrew has sufficient training to detect unsafe conditions
   - Aircrew has sufficient training to make judicious decisions to continue the mission or require maintenance action



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11-2 Series - Flying Operations

The aircrew must have sufficient training to detect airworthiness problems prior to accepting the aircraft for the mission and during the mission.

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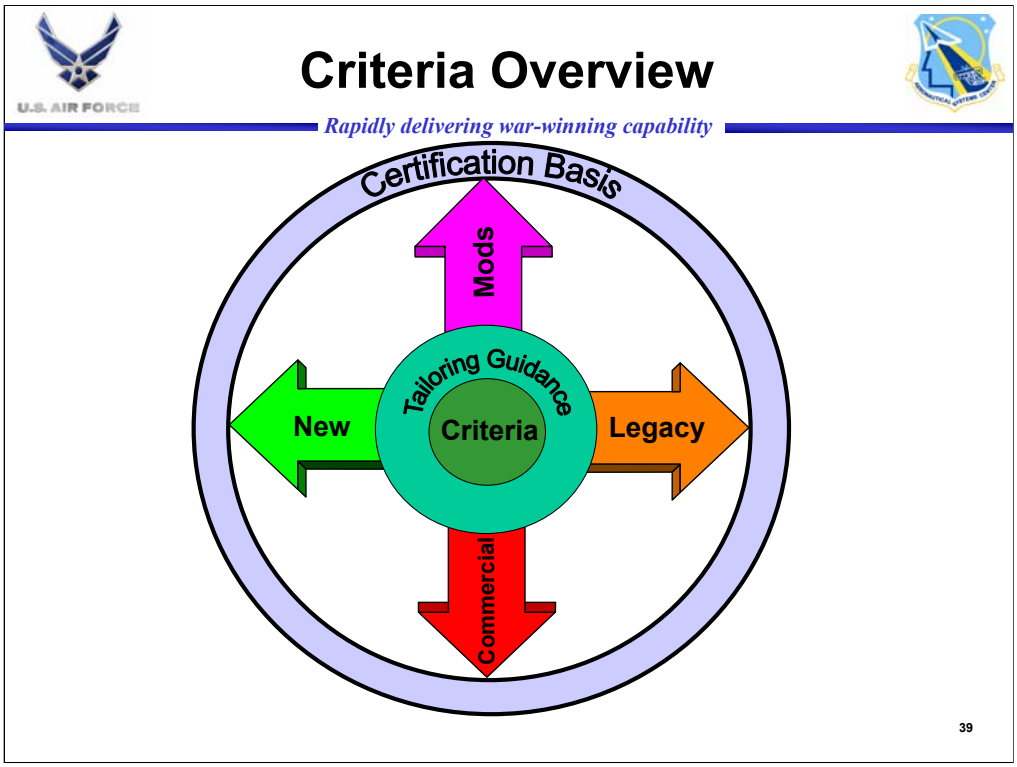
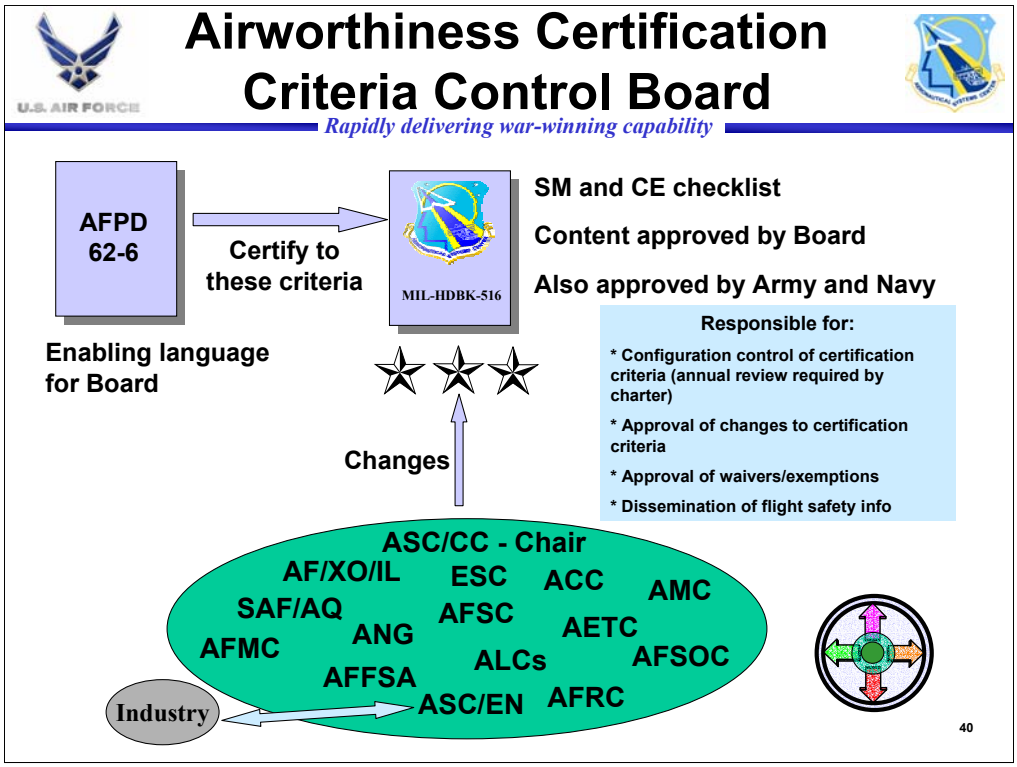


This section will discuss how to establish the airworthiness certification basis from MIL-HDBK-516 for these four types of programs.



MIL-HDBK-516 is a checklist for the SM and CE to use for airworthiness certification. Its contents are approved by the Airworthiness Certification Criteria Control Board (AC^3B) and all wording changes require AC^3B approval.

Industry coordination of proposed criteria changes is conducted by ASC/EN.

Certification Criteria Groundrules and Assumptions

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- Top-level checklist for SMs and CEs
  - Tailorable
  - Qualitative
- Safety of flight and ground operations only
- Applicable at any point in system life cycle
- Primary focus of airworthiness certification is on the design
- Covers what needs to be addressed for airworthiness certification, not how to do it

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MIL-HDBK-516 was intended to be used as a checklist for defining what needs to be addressed. Therefore, it is qualitative in nature and is tailorable for each program.

While the primary focus of our airworthiness certification is on safety of the design, other aspects and processes must be verified to be functioning properly for the SM to have confidence that the design can be built, operated, and maintained safely.

Criteria Application

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- MIL-HDBK-516 is intended to cover all possible safety related design attributes for all types of aircraft -- new and legacy
- A Tailored Airworthiness Certification Criteria (TACC) document is a permanent and active document for a specific aircraft type
  - Developed by the CE and/or contractor
  - Approved by the SM after coordination by ASC/EN and user
  - Identifies the specific certification criteria that apply (certification basis) to a mission-design-series (MDS) or group of MDS aircraft
  - Used to evaluate baseline aircraft and airworthiness impacts of future configuration and procedural changes
  - Includes or references supplemental material (e.g. “hard numbers”)

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The required method for applying the airworthiness certification criteria is to document the result of tailoring in a separate document called the *Tailored Airworthiness Certification Criteria* (TACC). The tailoring effort can be accomplished by the contractor. Coordination by ASC/EN is required prior to SM approval (28 Jan 02 HQ AFMC/EN memo). User coordination is recommended.

One TACC document could cover more than one Mission Design Series (MDS) of aircraft (e.g. F-16A/B). The number of TACC documents for a particular MDS should be influenced by the number of distinct configurations addressed in the flight manual(s). If all the configurations of an aircraft are covered by a single flight manual, then you can likely cover them all with a single TACC document. If the configurations and capabilities become so unique as to require different flight manuals, then they should also have separate TACC documents (e.g F-16 A/B and F-16 C/D).

Criteria Tailoring

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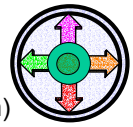
- Applicable criteria cannot be modified or identified as not applicable
  - Example: Margins of safety for structure
- Specific criteria or portions of applicable criteria can be identified as not applicable (N/A)
  - Example: Life support criteria will be N/A for an unmanned air vehicle (UAV)
  - Example: Store separation characteristics for aircraft that don't jettison stores
- Add criteria for unique applications and add measurable parameters to applicable criteria
  - Example: Engine feed fuel system proof pressure of 2.0 times maximum operating pressure (measurable parameter)
  - Example: Criteria for a UAV control station (unique application)



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The CE should add specific measurable parameters (i.e. hard numbers) to supplement the airworthiness certification criteria where appropriate and data is available. The supplemental criteria needs to add value to the definition of airworthiness requirements.

The working version of the TACC should contain all of the criteria from MIL-HDBK-516 with the applicability disposition indicated plus references to other documents that contain the supplemental information. Rationale for identifying specific criteria as not applicable should also be included.

Engine feed fuel system example came from JSSG-2009 para. E.3.4.5.1.5 to supplement MIL-HDBK-516 para. 8.3.5.

Airworthiness Criteria

Emergency Egress

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MIL-HDBK-516

9.1 Escape and egress system:
9.1.2 Verify that escape exits and escape routes are provided . . . .
9.1.4 Verify that devices for ground emergency egress assist (slides, descent reels, life rafts, etc.) and their deployment handles/actuators . . . .
9.1.5 Verify that ground emergency egress procedures exist . . . .

Joint Service Spec Guides

3.13.4 Search and rescue provisions: . . . Emergency egress and survival provisions and equipment should be provided . . . that meets applicable Federal Aviation Regulations . . . .
When the height of the floor of the aircraft exceeds 6 feet for the normal aircraft attitude on wheels or adverse attitude in a crash situation, evacuation assist equipment should be provided for successful post egress of the aircraft. Some types of emergency ground escape equipment are . . . .

code of federal regulations
Aeronautics and Space
Title 14
Parts 1 to 199
Revised January 1, 1999

25.810 Emergency egress assist means and escape routes:
(a) Each non over-wing Type A, Type B or Type C exit, and any other non over-wing landplane emergency exit more than 6 feet from the ground with the airplane on the ground and the landing gear extended, must have an approved means to assist the occupants in descending to the ground . . . .

This shows that there will be a comparable level of detail with the FAR when MIL-HDBK-516 is supplemented as intended for each program.

Supplemental information for applicable criteria can be extracted from the JSSG and FAR references provided in the MIL-HDBK-516 Appendix.

Airworthiness Criteria

Concurrent Servicing

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MIL-HDBK-516

16.1-Maintenance manuals/checklists: Verify that maintenance checklists are available for critical maintenance tasks, such as fuel and oxygen servicing procedures . . . .

Joint Service Spec Guides

JSSG-2001, 3.3.10.2.1-Personnel Safety and Health: "The operation, maintenance and repair of the air vehicle and equipment shall not induce risk hazard consequences to personnel…" Concurrent servicing requires approval via System Safety Engineering Analysis process (AFI 91-202, para. 9.7). Experts determine best ways to mitigate hazards. A formal analysis is performed. Aircraft with approved concurrent servicing procedures are listed in Table 6-1 of TO 00-25-172 (Ground Servicing of Aircraft and Static Grounding/Bonding).

121.135,b,18: Identifies the requirement for "Procedures for refueling aircraft, eliminating fuel contamination, protection from fire (including electrostatic protection), and supervising and protecting passengers during refueling." - Essentially inspectors review ground operations manuals per ATA 103 standard and OEM recommendations regarding concurrent servicing.

MIL-HDBK-516 also contains criteria that aren't related directly to the aircraft design as shown in this example.

Waivers/Exemptions

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- Waiver -- A temporary release from meeting specific *Airworthiness Certification Criteria*
  - Ensures all applicable airworthiness criteria eventually achieved
  - Provides SM time to budget for corrective action
  - Closure plan required to delineate approach and schedule to achieve full compliance
- Exemption -- A permanent release from meeting specific *Airworthiness Certification Criteria*
  - Applies when specific criteria will never be met
  - No closure plan required
- ASC/CC, as AC^{3}B Chair, delegated approval authority to ASC/EN

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The process for waivers or exemptions, reviewed by the AC^{3}B during their 2002 virtual meeting, was approved for implementation by ASC/CC on 17 Jan 2003. Approval authority was also delegated to ASC/EN on the same date.

Waiver & Exemption Process

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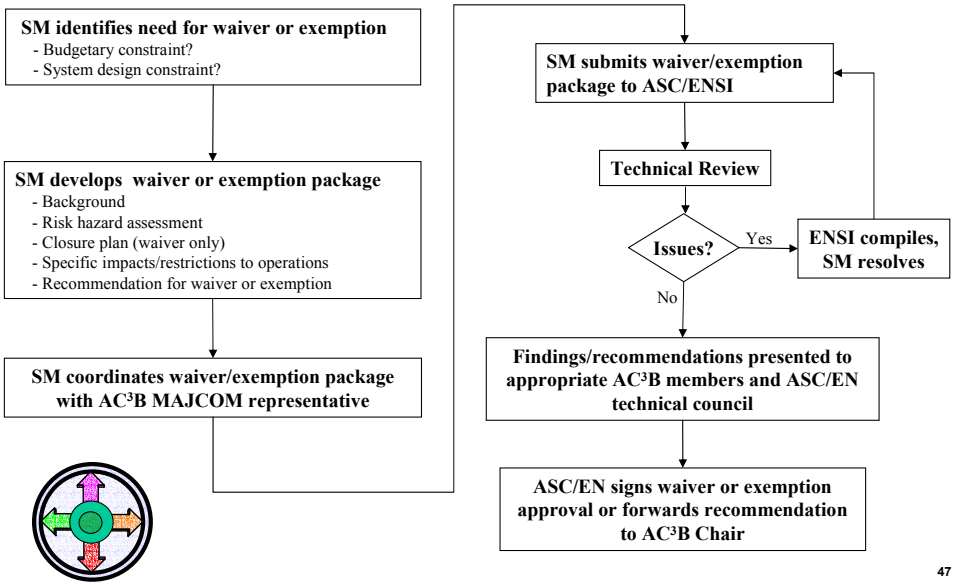

The need for a waiver or exemption to compliance with certain applicable airworthiness criteria in MIL-HDBK-516 is identified by the program office. Criteria can't just be declared "not applicable" when the design doesn't comply with the otherwise applicable criteria. Adequate risk management is the most important aspect to be conveyed in the request package.

Review of TACC Documents

HQ AFMC/EN Memo, 28 Jan 2002

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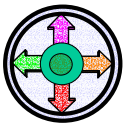
- Creating TACC document and documenting method of compliance are critical technical activities leading to SM certification decision
- Directs aircraft program CEs to coordinate draft TACC document with ASC/EN prior to SM approval
  - Strengthens airworthiness certification process
  - Establishes Command-level best practice to assure technical consistency
- Airworthiness Certification Criteria Control Board (AC^3B) provides final resolution on any major coordination issues related to particular airworthiness criterion
- AC^3B members also recommended coordination with the user prior to SM approval



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This memo was coordinated with HQ AFMC/DR and ASC/CC.

Coordination with the user was not part of the AFMC memo but came later as a recommendation from some AC^3B members.

A TACC document is required for all Air Force aircraft, including commercial derivative aircraft that are fully FAA certified.

TACC Document Contents

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- Document configuration information (date/revision/SM)
- MDS description
- Certification basis
  - Applicable MIL-HDBK-516 criteria and/or
  - FAA type certification basis
  - Approved waivers/exemptions
- Supplemental data
  - Location of specific measurable parameters
  - Location of instructions for maintaining airworthiness
- Limitations

The ASC/EN review is focused on the certification basis portion. ASC/EN coordination is required each time the certification basis portion of the TACC document is changed. Changes in the other portions of document do not require re-coordination of the document by ASC/EN.

MIL-HDBK-516 Tailoring
Legacy System

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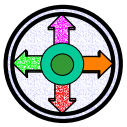
- Use MIL-HDBK-516 and existing aircraft documentation for developing the certification basis section of the TACC document
  - Specifications
  - Reports
  - Technical manuals
  - FAA type certificates
  - Other existing documentation
- TACC document should identify applicable specific criteria for different configurations of MDS, where necessary
- Use TACC document certification basis and current version of MIL-HDBK-516 for defining applicable airworthiness certification criteria for future modifications



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Legacy systems refer to those systems that were in sustainment on 1 Oct 2000.

MIL-HDBK-516 is used to define the applicable criteria for the aircraft, unless the aircraft is fully FAA type certified. Existing documentation is used to define specific measurable parameters to supplement the applicable criteria.

The SM approved TACC document is used with the current MIL-HDBK-516 to define the applicable criteria for a modification that will not be FAA certified. The TACC document is updated as necessary as a result of the modification.

MIL-HDBK-516 Tailoring
New Developmental System

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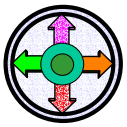
- Initiate TACC document in first phase of development
  - Define draft certification basis from MIL-HDBK-516
  - Use cross reference in Appendix to aid in developing specific measurable parameters
- Update for each development phase
  - Include in RFP and contractual specification for each phase
  - Must be complete enough to support planned testing
- TACC document for production configuration approved prior to start of system level qualification testing
  - Defines airworthiness requirements to be verified
  - Updated as necessary for capability changes



The TACC document for a new developmental aircraft system defines the applicable criteria that must be verified during the System Development and Demonstration Phase. While the specifics of the design may change, the TACC document would not unless there is additional criteria added or deleted due to a configuration/mission change.

Applicability to Commercial Derivative Systems

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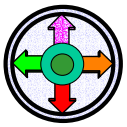
- AF airworthiness certification by SM required unless FAA issues an Airworthiness Certificate
  - Aircraft must be civil registered (i.e., N number)
  - All design features must be FAA type certified
  - FAA required documentation maintained throughout system lifetime
- FAA type certification is sufficient basis for AF airworthiness certification for similar intended usage, operational environment, mission profiles, etc.



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All three conditions must be met before the FAA will issue a Standard Airworthiness Certificate.

Both AFPDs for commercial derivative aircraft require the use of FAA certification results whenever possible. Since the whole focus of FAA certification is on airworthiness, these results can be used to satisfy comparable Air Force airworthiness certification requirements without additional verification for similar usage, operational environment, mission profiles, etc.

MIL-HDBK-516 Tailoring
New Commercial Derivative System

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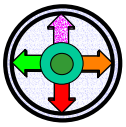
- TACC document not required for passenger carrying aircraft RFP
  - Initiate TACC document when airworthiness certification basis has been defined
  - Use MIL-HDBK-516, including Appendix, for design features the FAA has determined are not certifiable or because of differences in usage, operational environment, mission profiles, etc.
  - TACC document approved after waiver approval (AFPD 62-4) and prior to start of system level qualification testing, where possible
- Certification basis required for portion of hybrid commercial derivative aircraft design that will not be FAA certified
  - Use MIL-HDBK-516, including Appendix
  - Include in acquisition RFP and contract specification
  - Initiate TACC document when airworthiness certification basis (USAF and FAA) has been defined
- Update as necessary to address cert basis changes



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A draft TACC document is not necessary in the RFP for a commercial derivative aircraft that will be fully FAA type certified since the certification basis is defined by the FAA. The TACC document is initiated after contract award when the airworthiness certification basis has been sufficiently defined.

The TACC document may need to be updated and approved after the start of qualification testing since the FAA may identify some uncertifiable design features after the compliance verification effort has started.

The certification basis section of the TACC document includes the FAA Type Certification Basis and the applicable MIL-HDBK-516 criteria for the design features not covered completely by the FAA type certification.

Commercial Derivative FAA Certification Waivers

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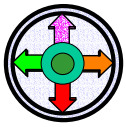
- AFPD 62-4 allows waivers “after all possible solutions to resolving FAR issues have been exhausted”
- AFPD 62-5 requires hybrid aircraft to be “in compliance or modified to comply with FAA airworthiness standards” when used for passenger carrying missions
- Waiver authority has been delegated to ASC/EN
- Data needed to assure approval
  - Design is required to fulfill mission need
  - No FAA certifiable design alternatives exist
  - Design can’t be certified through an FAA Equivalent Level of Safety finding or Special Condition
  - Risk assessment shows that the design won’t compromise MIL-HDBK-516 airworthiness certification criteria



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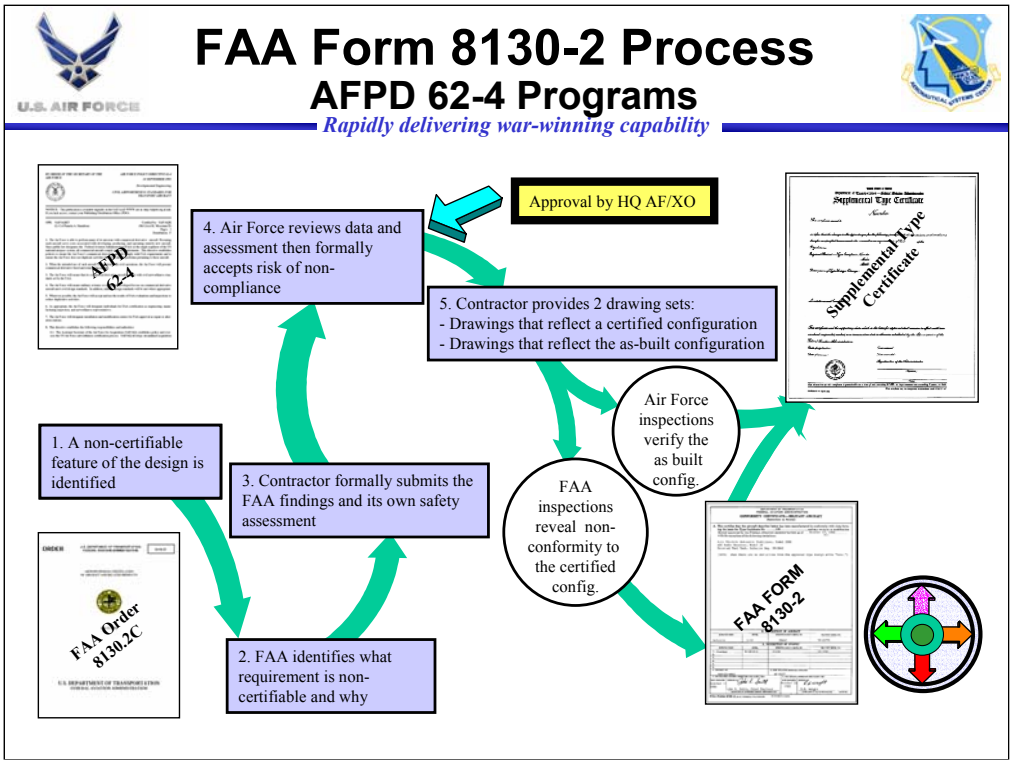
A waiver approval is required for each design feature not FAA certified if the aircraft will be used for passenger carrying missions in that configuration.

HQ USAF/XO delegated waiver authority to ASC/CC, who designated the ASC/EN Director as the approval authority for airworthiness waiver and exemption requests, including AFPD 62-4 waiver requests.

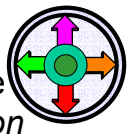


This chart shows the process for accepting deviations to FAA FARs on passenger carrying commercial derivative aircraft. There are three significant points to make here. First, AFPD 62-4 requires HQ Air Force level approval of design features to be entered on FAA Form 8130-2. The second point is the step 3 to step 4 portion of the process. The design feature is reviewed to verify that it is required to fulfill a mission need, that the design can't be certified through an FAA Equivalent Level of Safety finding or Special Condition, that there are no acceptable design alternatives that can be certified, and that the design won't compromise Air Force airworthiness certification criteria. And the third is step 5. The contractor has to develop two sets of drawings for the non-compliant features: one set for FAA type design approval and one set for the as-built configuration.

Airworthiness Criteria Tailoring
Modernization Programs

Rapidly delivering war-winning capability

- SM approved TACC document is available
  - Document which certification basis criteria apply to mod
  - Add other criteria from MIL-HDBK-516 as necessary
  - Supplement as needed to define measurable parameters
- SM approved TACC document is not available yet
  - Define applicable criteria from MIL-HDBK-516
  - Supplement as needed to define measurable parameters
  - Provide mod airworthiness criteria as input to TACC development
- Criteria applicable to a reportable modification are defined in a *Modification Airworthiness Certification Criteria* (MACC) document



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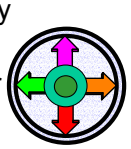
As the Air Force works towards total fleet airworthiness certification, a particular aircraft design currently undergoing modification may or may not have approved TACC document to be used by the modification program as a checklist for their verification efforts. In both cases (approved TACC document or not), ensuring all appropriate criteria are addressed and subsequently verified imparts good technical discipline in the modification engineering efforts. This is accomplished by developing and obtaining ASC/EN coordination on a MACC working document for each reportable modification. The MACC document should identify only those criteria applicable to the modified area(s) of the aircraft after analyses have shown that all other criteria aren't impacted by the modification (e.g., no changes to the function, environment, or usage spectrum). ASC/EN and user coordination should be obtained early in the modification process on both the draft MACC document and the updated draft TACC document if it requires an update due to the modification (e.g., updated MIL-HDBK-516, change in criteria applicability).

Reportable Modification

Rapidly delivering war-winning capability

- All modifications require an airworthiness assessment, but not all are reportable
- Permanent modifications that result in a significant airworthiness impact are reportable
- Examples of significant airworthiness impact:
  - Changes that affect structural integrity, propulsion/drive system operation (including software), weight & balance, etc.
  - Changes to the exterior contour/mold line
  - Changes to displays which may affect situational awareness
  - Changes that affect operating limits and/or emergency procedures of the flight manual
  - Operation of carry-on equipment that could distract or degrade crew performance



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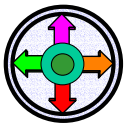
All modifications require an airworthiness assessment, but not all are reportable. For the purposes of airworthiness certification reporting per AFPD 62-6, paragraph 2.8.7, the chief engineer will conduct an assessment of all permanent modifications to determine which ones result in a significant airworthiness impact. Written notification to ASC/EN of airworthiness recertification is required after all applicable criteria defined in the MACC document have been verified. More examples of significant airworthiness impact are in MIL-HDBK-514.

MIL-HDBK-516 Updates
Modernization Programs
Rapidly delivering war-winning capability

- Aircraft that are currently airworthiness certified
  - Compliance with the updated MIL-HDBK-516 is required when making reportable modifications
- Aircraft with approved TACC document but not airworthiness certified yet
  - Approved TACC document may be used to complete the certification effort
  - However, to simplify future recertifications, the SM may elect to upgrade the TACC document immediately to include all applicable criteria from the updated MIL-HDBK-516
- Aircraft with no approved TACC document
  - Compliance with the updated MIL-HDBK-516 is mandatory



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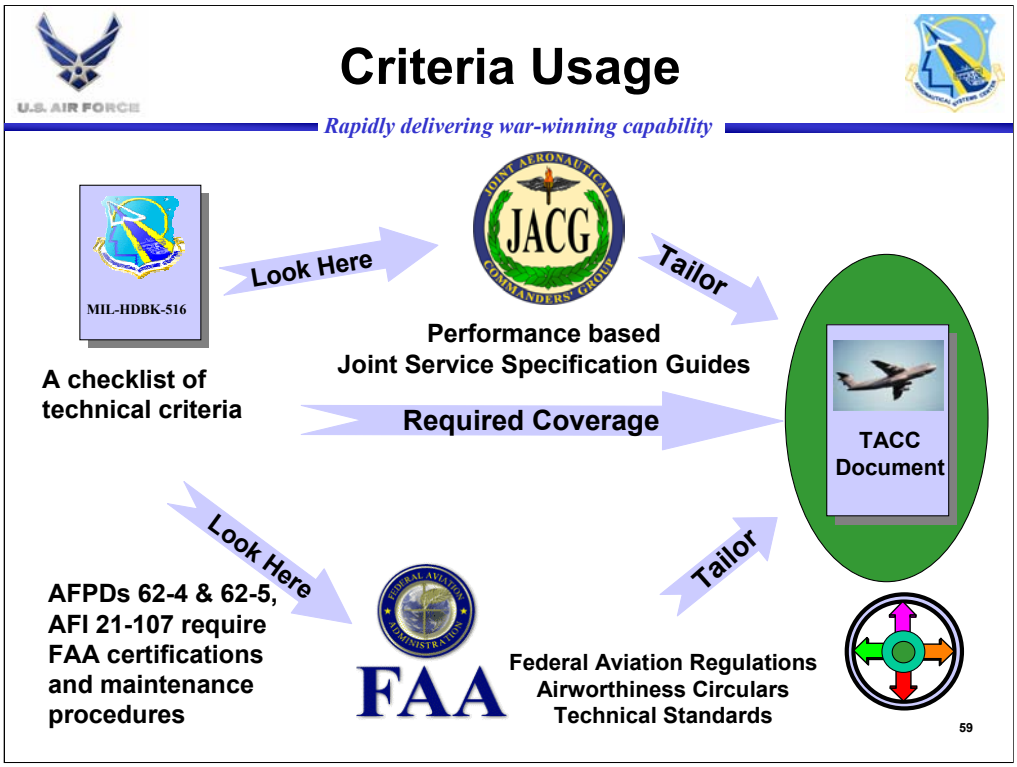
New airworthiness criteria are developed based upon feedback from airworthiness implementers, new technology development, annual reviews, etc, and are published upon approval by the AC^{3}B (for the Air Force), the Army, and the Navy. Particularly during the initial, formative period of USAF airworthiness certification, there may be substantive changes to MIL-HDBK-516.

These groundrules ensure continued Air Force aircraft compliance with current airworthiness criteria.



This chart summarizes the tailoring process for a new developmental system.

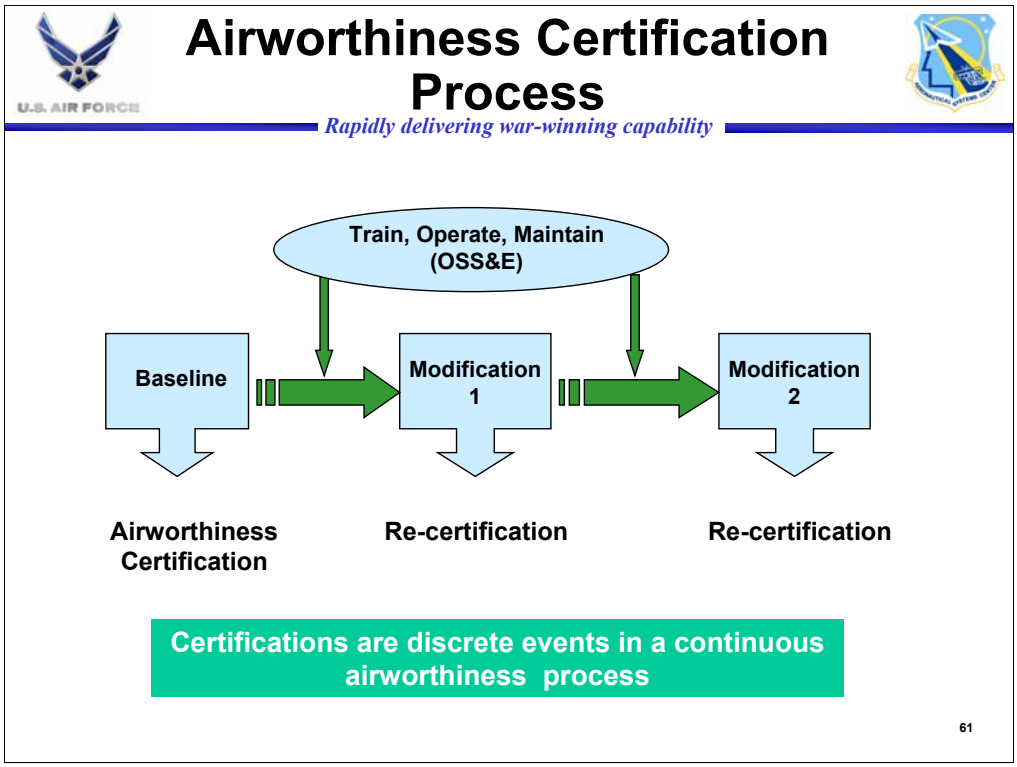
The program starts with MIL-HDBK-516. After determining which criteria apply, the CE then uses the cross reference table in the Appendix, which provides references to appropriate JSSG and FAA information, to define specific measurable parameters (i.e. hard numbers) necessary to make the criteria more meaningful. Additional criteria are also added to address areas that aren't covered in MIL-HDBK-516. All of this information flows into the TACC document, which fully defines the airworthiness certification basis for the aircraft.

JACG - Joint Aeronautical Commanders Group

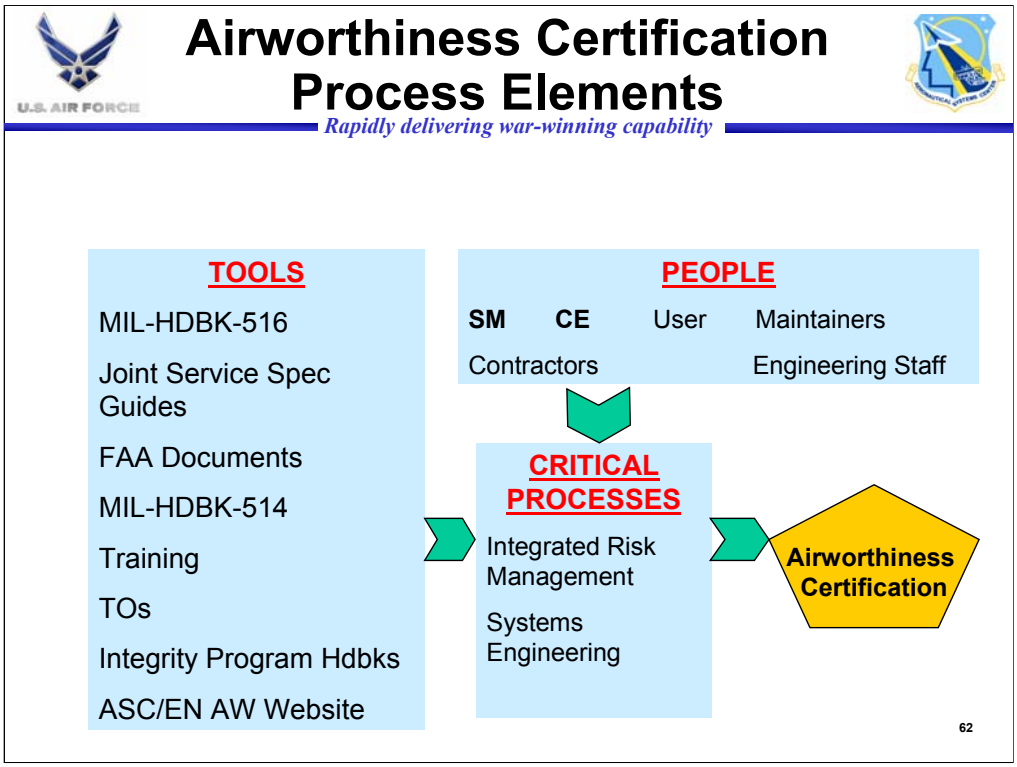
Overview

Rapidly delivering war-winning capability

- Background
- Responsibilities
- USAF-FAA Comparison
- Tenets of Airworthiness
- Airworthiness Criteria
- **Airworthiness Certification Process**
- Implementation
- Summary



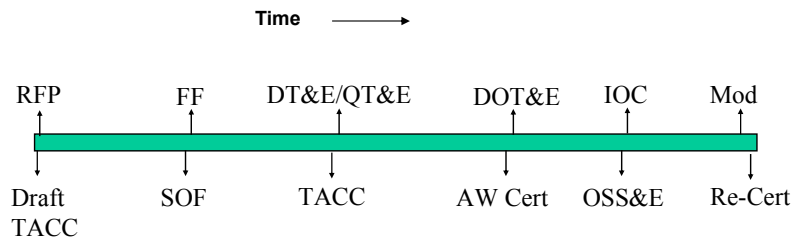
After the initial airworthiness certification of the aircraft, maintenance of airworthiness falls under OSS&E. Impact on the airworthiness certification must be assessed any time the aircraft is modified. Reportable modifications require re-certification of airworthiness. Airworthiness certification is reinstated after verification that other modifications comply with the certification basis.



This shows the tools, people, and critical processes that are used in the airworthiness certification process.

New System/Modification Airworthiness Cert Process

Rapidly delivering war-winning capability



This shows how the airworthiness certification process fits within the normal acquisition process and how it relates with OSS&E. Airworthiness certification must occur before release for operational use if there won't be a DOT&E phase. Each modification program will repeat some or all of this process.

Notification of Airworthiness Certification

Rapidly delivering war-winning capability

- Written notification to ASC/EN required
  - Initial certification of legacy and new aircraft
  - Recertifications due to reportable modifications
- Notification must include:
  - Copy of SM approved TACC document (only if updated for modifications)
  - Copy of airworthiness certificate (sample if issued for each aircraft)

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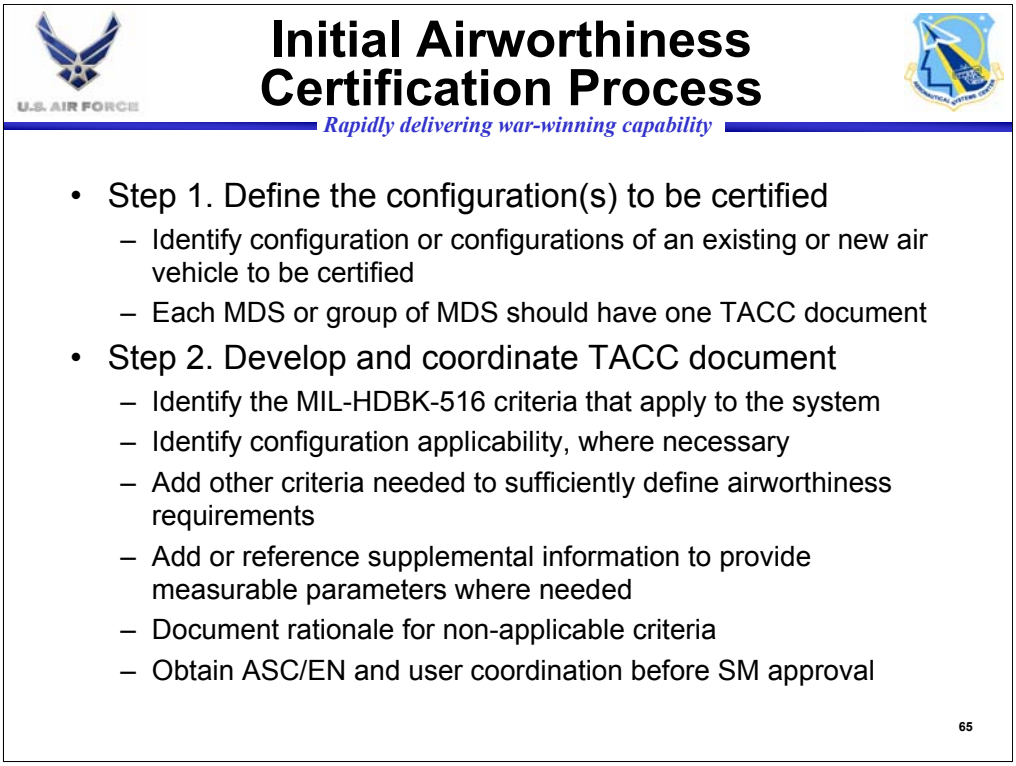
This notification requirement comes from AFPD 62-6, para. 2.8.7; ASC/CC memo, same title, dated 19 July 2001; and MIL-HDBK-514.

The information that comes with the notification will be used to determine if the policy is being properly implemented and if additional guidance or clarification of airworthiness criteria is needed.



Each MDS should have no more than one TACC document. As stated earlier, a TACC document may cover more than one MDS; use technical manual applicability as a guide for certification basis applicability.

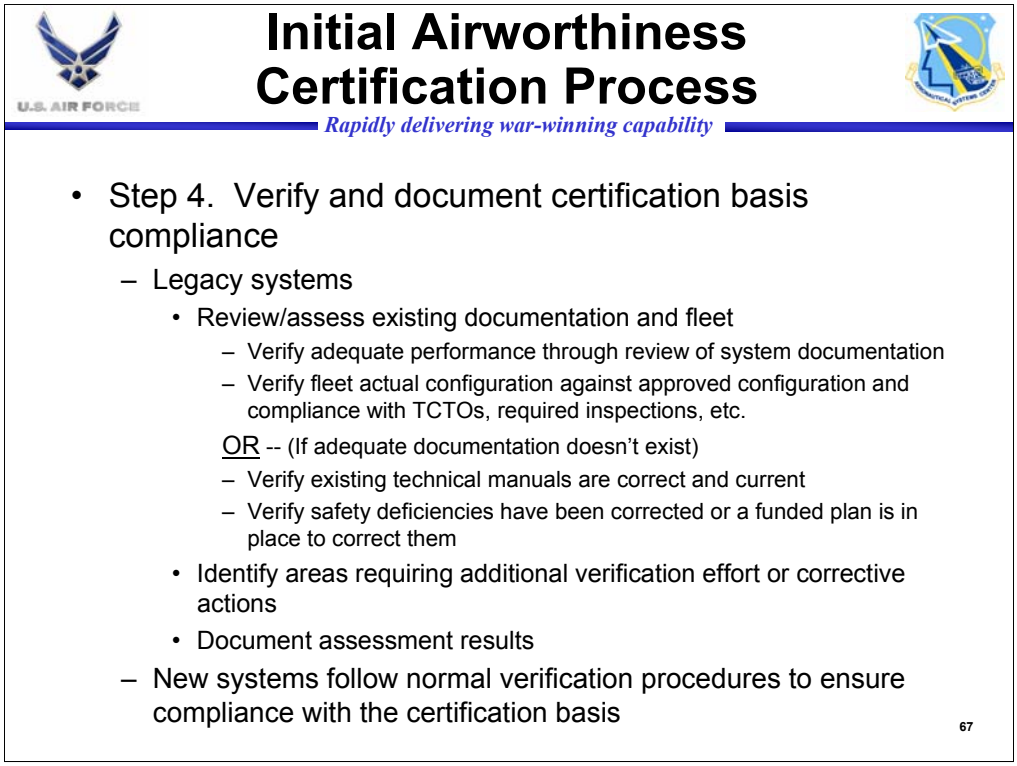
Initial Airworthiness Certification Process

Rapidly delivering war-winning capability

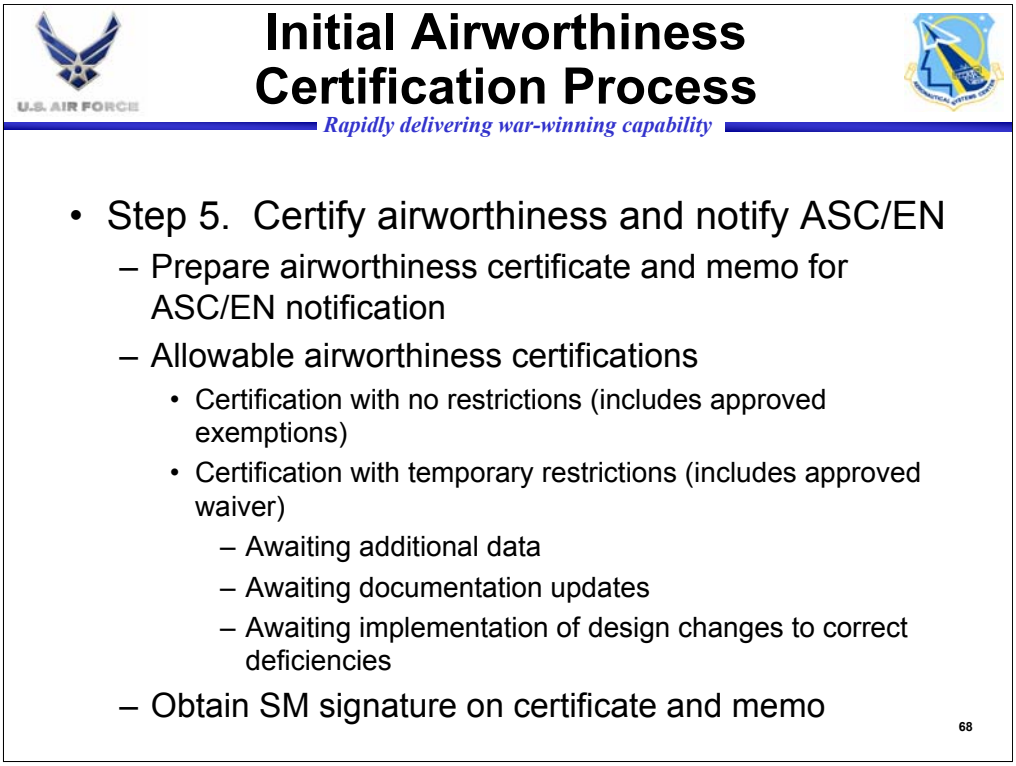
- Step 3. Identify supporting data for verifying certification basis compliance
  - Legacy systems
    - Gather applicable existing documentation: technical manuals, specifications, test data, maintenance data, demonstrations, analyses, inspections, configuration data, usage data, mishap rate, FAA type certificates, etc.
    - Review and validate change process compliance
      - Existence of a disciplined change process can be used to mitigate the need to re-validate individual past changes
      - Reverification of some criteria may be necessary if change process compliance has been inadequate
  - Determine method/procedure for verifying and documenting certification basis compliance

Existence of a robust configuration management process will reduce the verification effort for legacy aircraft.

New systems must have sufficient contractual tasking for collection of verification data and subsequent comparison with the certification basis.

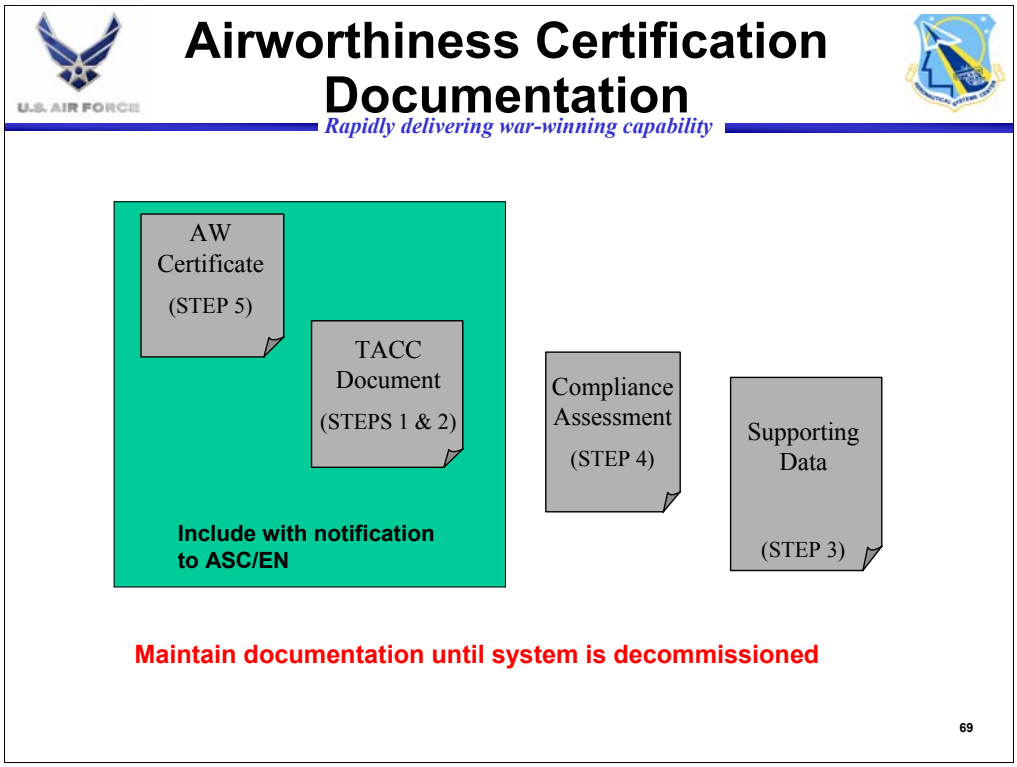


Because of tight budgets and the various ages of fielded systems, an alternative approach to airworthiness certification of legacy air systems that complies with the intent of AFPD 62-6 is warranted. Some legacy systems may not have an adequate paper trail from the original qualification to the current fleet configuration. For other systems, excessive effort would be required to search existing data for evidence of compliance with the airworthiness certification basis. In such cases, this approach is a reasonable and technically viable alternative for chief engineers and single managers to follow for first-time certification of airworthiness and it complies with the policy requirement that certification of legacy aircraft be achieved in a cost-effective manner consistent with safety.



When compliance has been verified, the SM signs an airworthiness certificate for each model, like-configured group of aircraft, or for each aircraft. When certification is issued for a group of aircraft, each aircraft within that group must comply with the airworthiness certification documentation.

The aircraft must be in compliance with all applicable criteria before the SM can certify airworthiness without restrictions, unless waivers or exemptions have been approved by the AC^{3}B. Requested waivers to applicable criteria also must be approved by the AC^{3}B before the SM can certify airworthiness, and the reasons for the waivers must be corrected before the restrictions can be lifted. Waivers are required before aircraft can operate with design features that don't comply with the certification basis unless the features are rendered safe and inoperable.

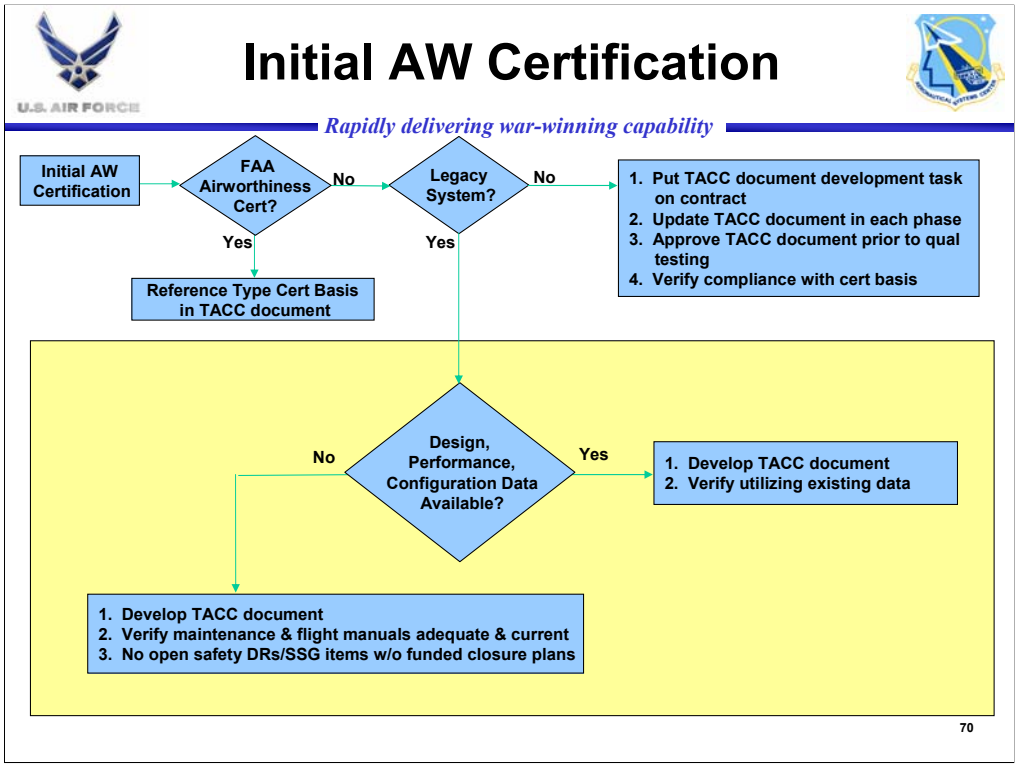


The top document is the airworthiness certificate.

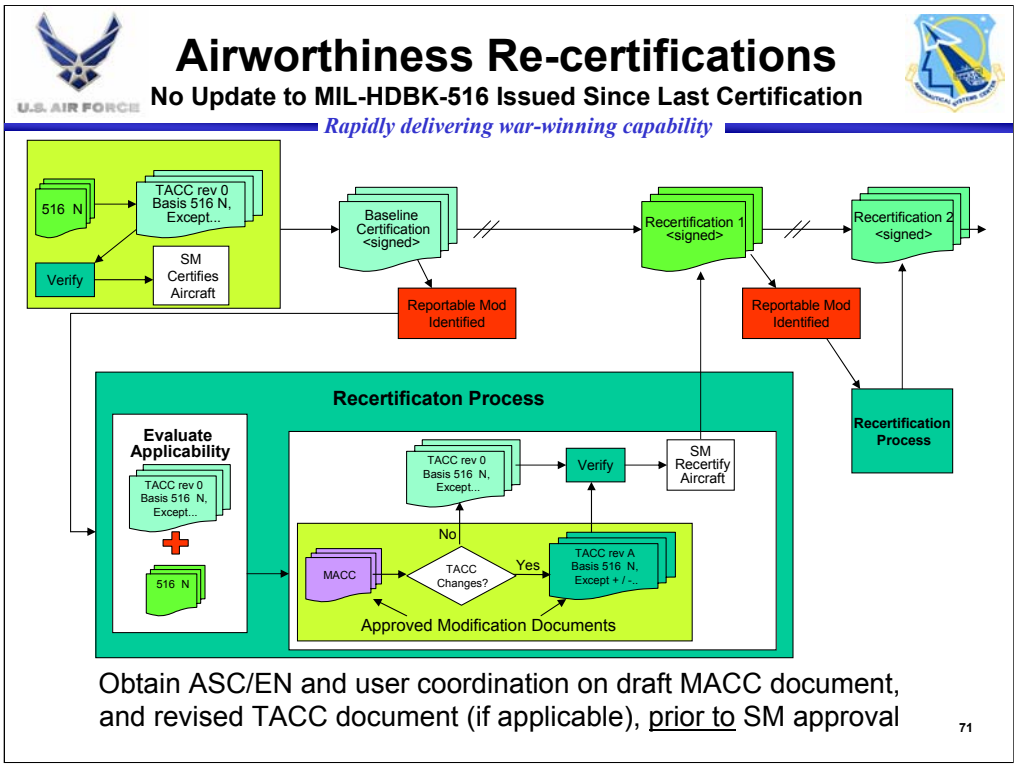
The TACC document defines the certification basis and the configuration definition.

The last two documents provide support for the first two documents and are not included with the required notification to ASC/EN.

This documentation package must be maintained until the system is decommissioned to support future airworthiness certification efforts, accident investigations, and other airworthiness related questions.



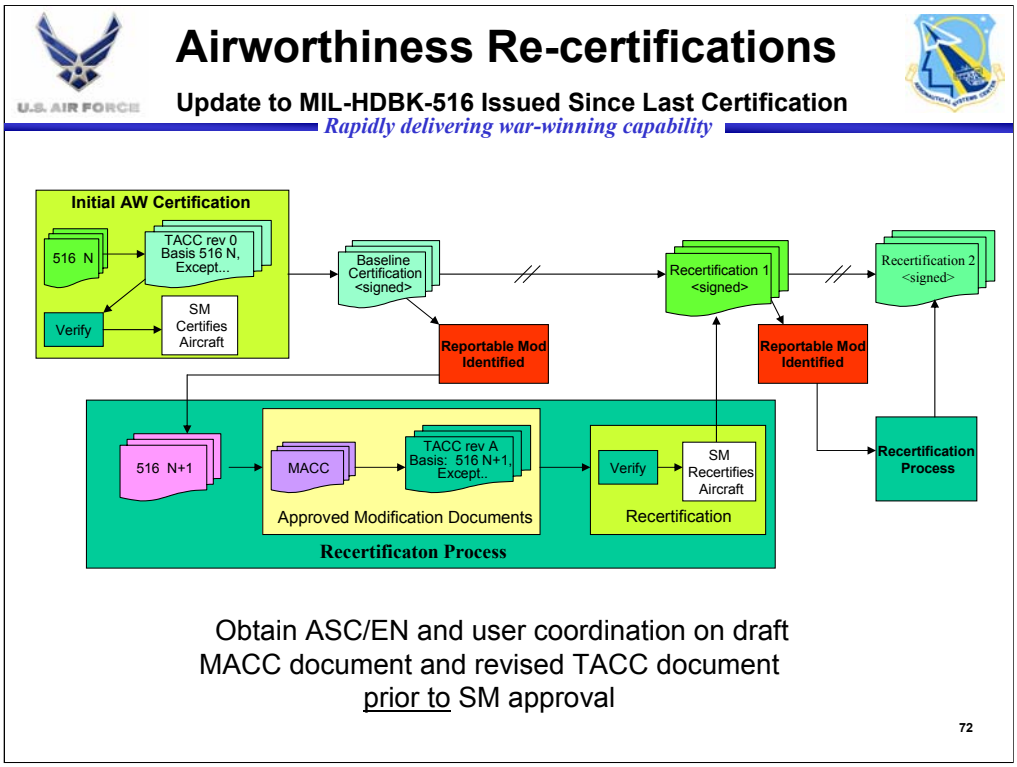
The highlighted portion is the process for legacy systems, as addressed in MIL-HDBK-514. The certification basis should be verified as much as possible with existing data. However, most legacy aircraft programs are using the "grandfather clause" approach (lack of an adequate configuration paper trail) to minimize the resources needed to establish the initial certification.



Use the certification basis in the TACC document for evaluating airworthiness of modifications. This is accomplished by creating a MACC document which is focused on areas affected by the modification. The TACC document and MIL-HDBK-516 should also be reviewed to see if any previously identified non-applicable criteria are now applicable due to added/deleted capability. The TACC document should be updated only if changes are required as a result of this review.

Obtain ASC/EN and user coordination on the draft MACC document, and revised TACC document (if applicable), prior to SM approval.

The SM recertifies airworthiness to the certification basis defined in the TACC document after verification of mod airworthiness to the criteria defined in the MACC document.



Use the latest version of MIL-HDBK-516 as the basis for evaluating airworthiness of modifications. This is accomplished by creating a MACC document which is focused on areas affected by the modification. The TACC document must also be revise to address all applicable criteria in the updated MIL-HDBK-516 , even for areas not affected by the modification effort.

Obtain ASC/EN and user coordination on the draft MACC document and revised TACC document prior to SM approval.

The SM recertifies airworthiness to the certification basis defined in the revised TACC document after verification of mod airworthiness to the criteria defined in the MACC document and verification of any new criteria that weren't covered during the modification effort. New criteria for the unmodified portion of the aircraft should be verified in the same manner as the initial airworthiness certification for legacy aircraft.

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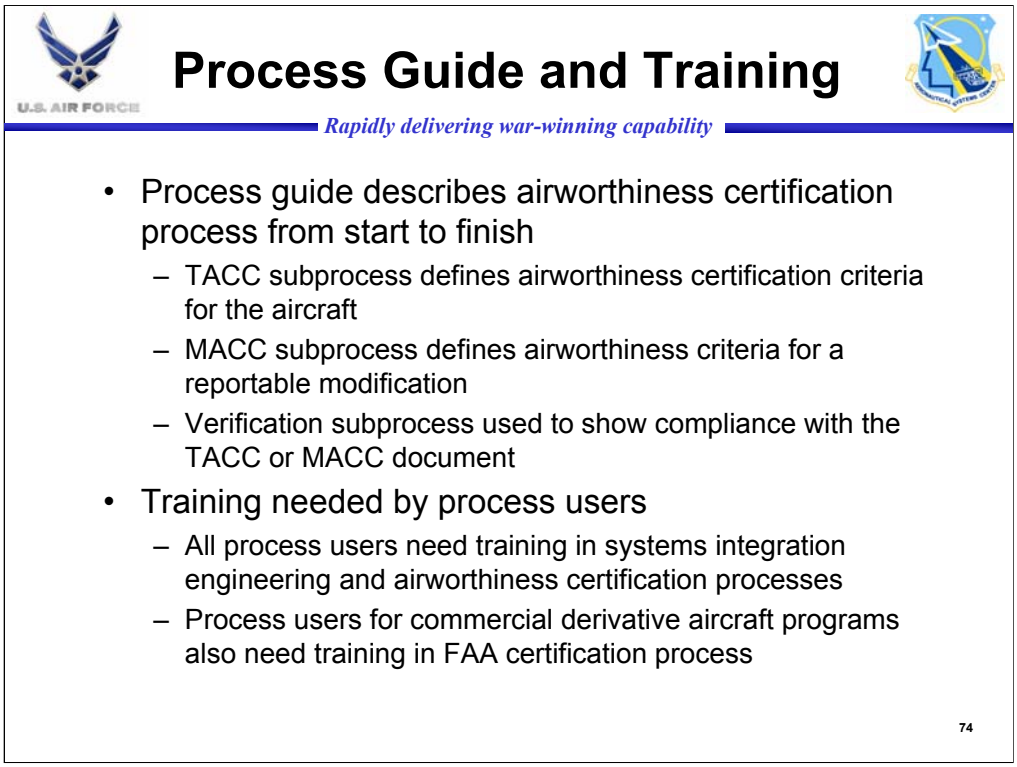


The airworthiness certification process consists of three subprocesses.

a. The TACC subprocess defines the airworthiness certification criteria for the whole aircraft and applies to the first time airworthiness certification of an aircraft and each time the airworthiness certification basis changes.

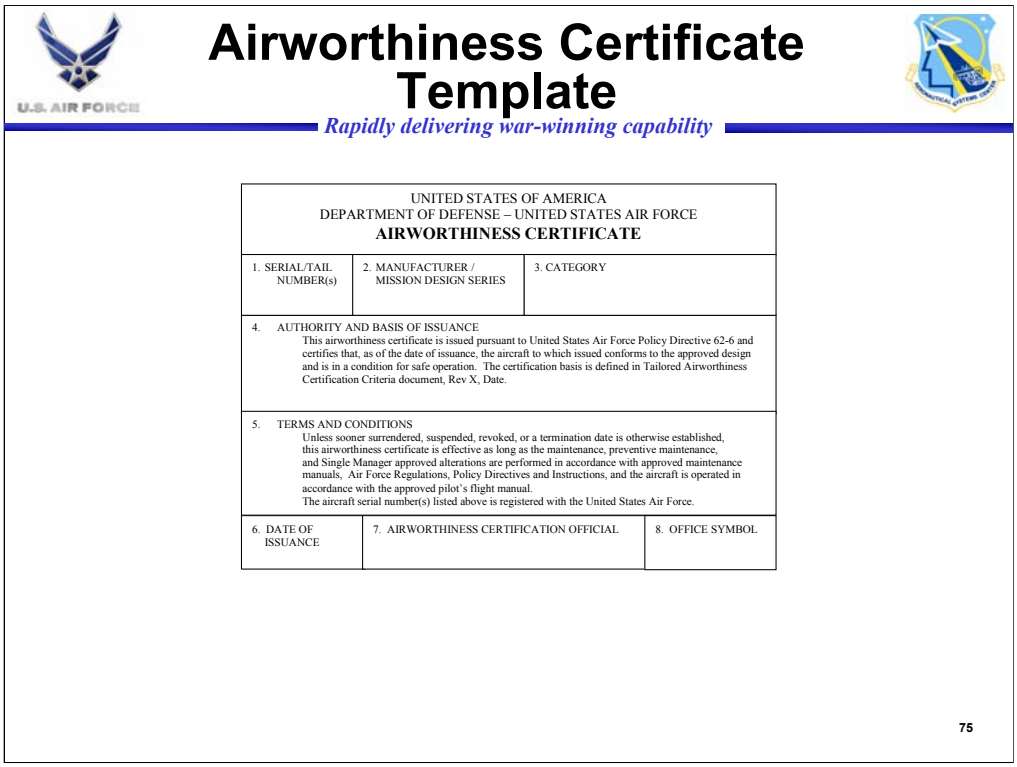
b. The MACC subprocess defines the airworthiness criteria for a reportable modification to an aircraft.

c. The verification subprocess is used to show compliance with either the TACC or MACC document and results in initial certification or recertification of airworthiness for the aircraft.

Airworthiness certification process users require the following skills and knowledge.

a. All process users need to understand all of the steps in the airworthiness certification process through training in the systems integration engineering and airworthiness certification processes.

b. Process users for commercial derivative aircraft programs also need a basic understanding of the FAA certification process and how to interface it with the Air Force airworthiness certification process. Training in the systems integration engineering, airworthiness certification, and FAA certification processes are needed for these users.



INSTRUCTIONS FOR COMPLETION OF CERTIFICATE:

Block 1: List the appropriate tail number or Air Force serial number of the aircraft. If this is a fleet certificate, list the applicable tail numbers, e.g., "90-01 through 93-12".

Block 2: List the airframe prime contractor and the designated Mission Design Series.

Block 3: List the appropriate certification category:

AFPD 62-6, Military: Aircraft with no FAA Type certification basis (F-16, F-15, F-22, etc)

AFPD 62-5, Commercial Derivative Hybrid Aircraft: Any fixed or rotary-wing aircraft procured as a commercial Type Certificated off-the-shelf developmental or non-developmental item and subsequently modified to meet Air Force mission requirements. These aircraft are not used for passenger carrying missions unless the aircraft is in compliance or modified to comply with FAA airworthiness standards.

AFPD 62-4, Commercial Derivative Transport Aircraft: Any fixed or rotary-wing aircraft procured as a commercial Type Certificated off-the-shelf non-developmental item. These aircraft are used primarily for transport of passengers.

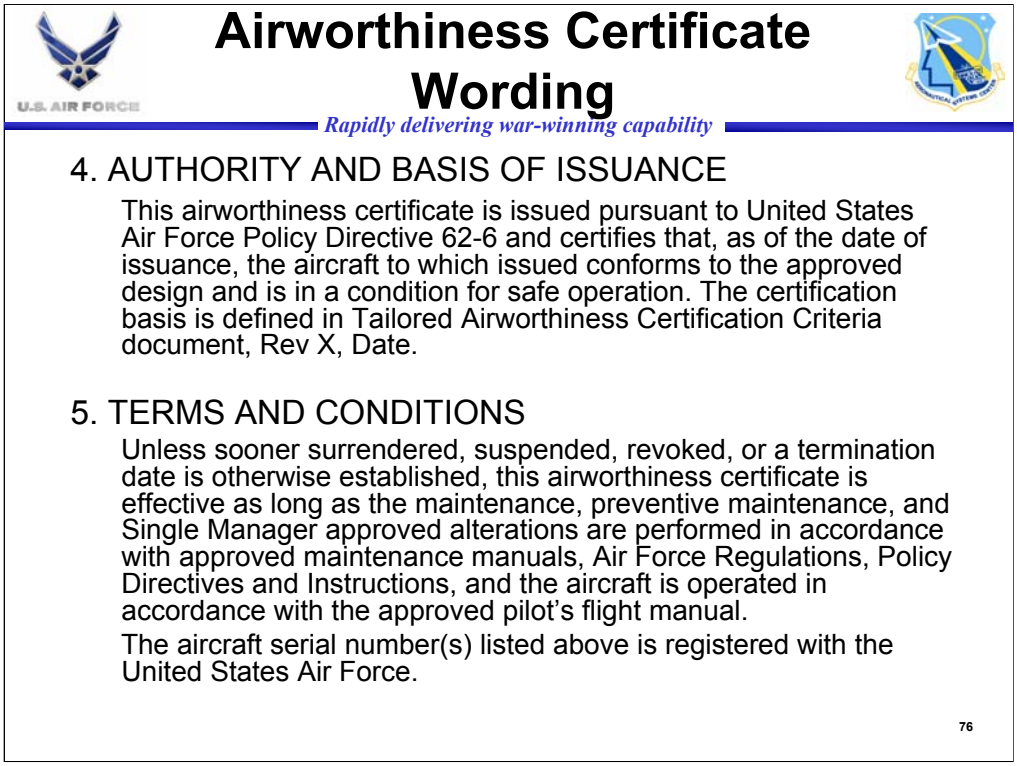
Block 4: Insert the applicable Tailored Airworthiness Certification Criteria document title, revision, and date. This documents the certification basis to which the aircraft system design was evaluated.

Block 5: The terms and conditions are a standard statement, no changes should be required to this block.

Block 6: List the date of record for which airworthiness was declared for the aircraft/fleet.

Block 7: Provide the Airworthiness Certification Official's typed name, rank, and signature as of the airworthiness date of record.

Block 8: Provide the Airworthiness Certification Official's office symbol.



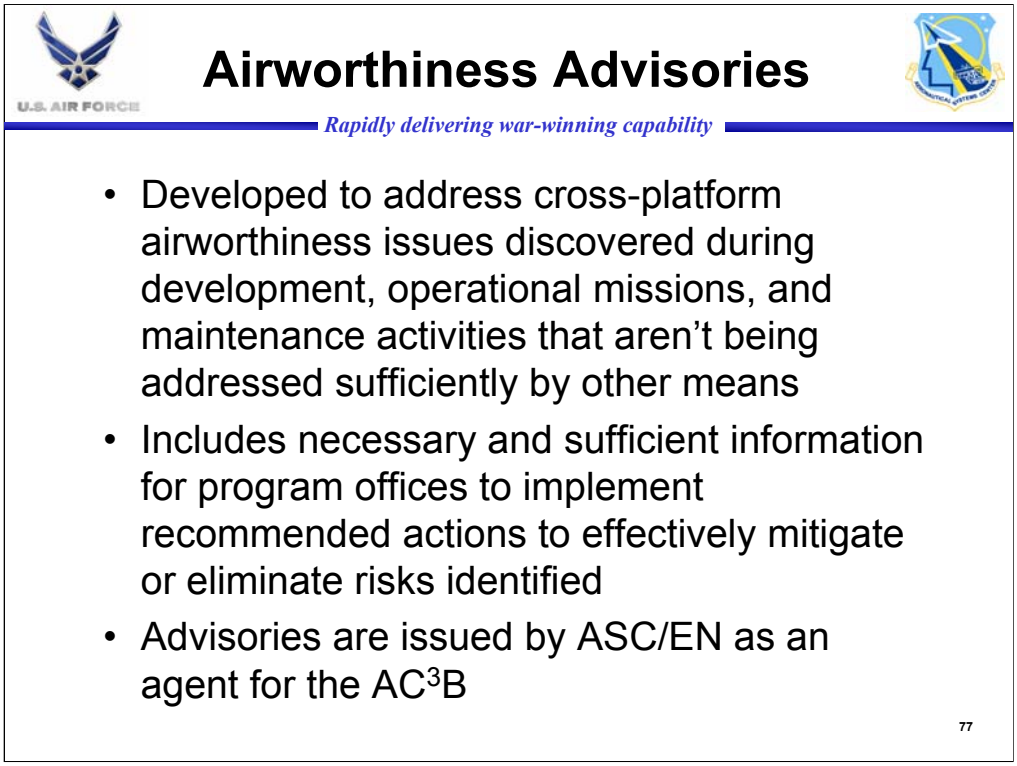
Block 4 of the airworthiness certificate addresses tenets 1 and 2.

Block 5 addresses tenet 3.

This information should be contained in all airworthiness certificates, whether the template is used or not.

A copy of the certificate should be included in the aircraft records (AFTO Form 781s) or physically displayed in the aircraft to reinforce the directive that unauthorized modifications will invalidate the airworthiness certification. It also provides reassurance to the aircrew that the aircraft design, as produced, is airworthy.

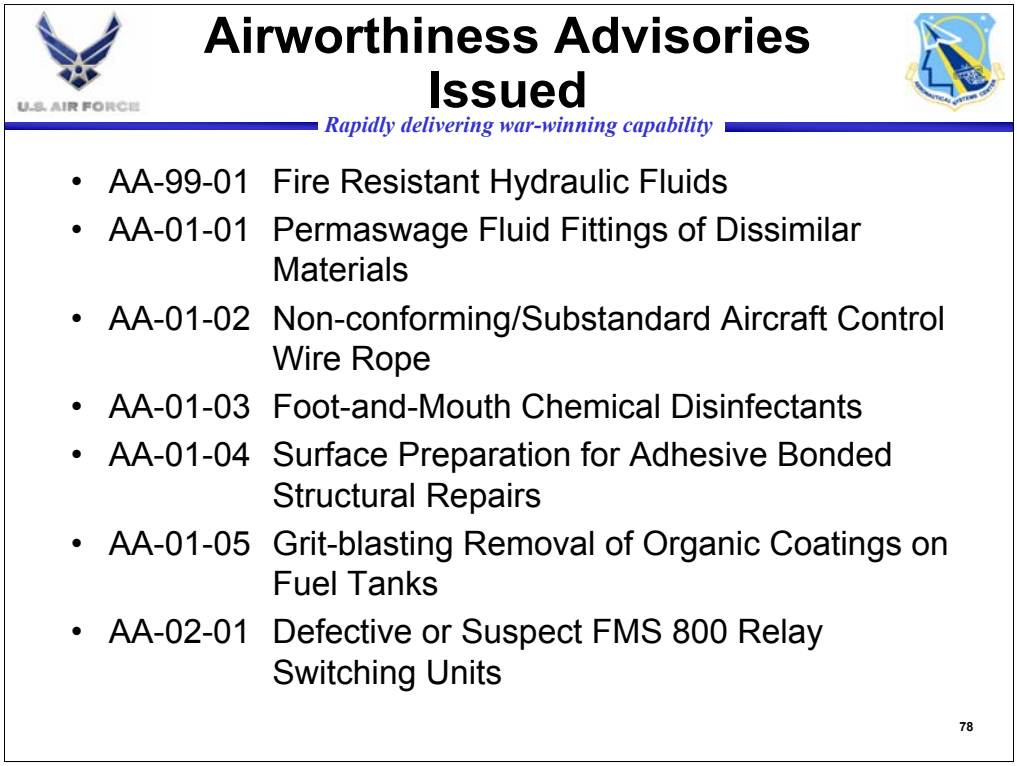
The airworthiness certificate remains valid until the user operates the aircraft outside the limitations imposed by the technical manuals, unauthorized modifications are done to the aircraft (i.e., the aircraft's airworthiness is no longer certain), or the system is decommissioned. Airworthiness certification is restored in the first case when the special inspections defined in the maintenance manual or by the Chief Engineer and any required corrective actions are completed. In the case of unauthorized mods, airworthiness certification is restored when the aircraft is returned to the approved configuration or the modification is approved and verified to be airworthy. System decommissioning provides an end-point to the SM's responsibility for airworthiness certification of the aircraft.



The airworthiness advisory process implements the AFPD 62-6 requirement for ASC to collect flight safety information for dissemination by the AC^{3}B.

As an agent for the AC^{3}B, ASC/EN developed this process for cross-platform airworthiness issues that aren't being addressed by other means (e.g., system safety).

Advisories are issued by ASC/EN, primarily to provide an early warning of potential actions that may become necessary to ensure continued airworthiness.



AA-99-01, 17 Sep 99 - "MIL-PRF-83282 is a more fire resistant hydraulic fluid than MIL-H-5606."

AA-01-01, 14 Feb 01 - Permaswage fluid fittings of dissimilar materials erroneously supplied under the same National Stock Number.

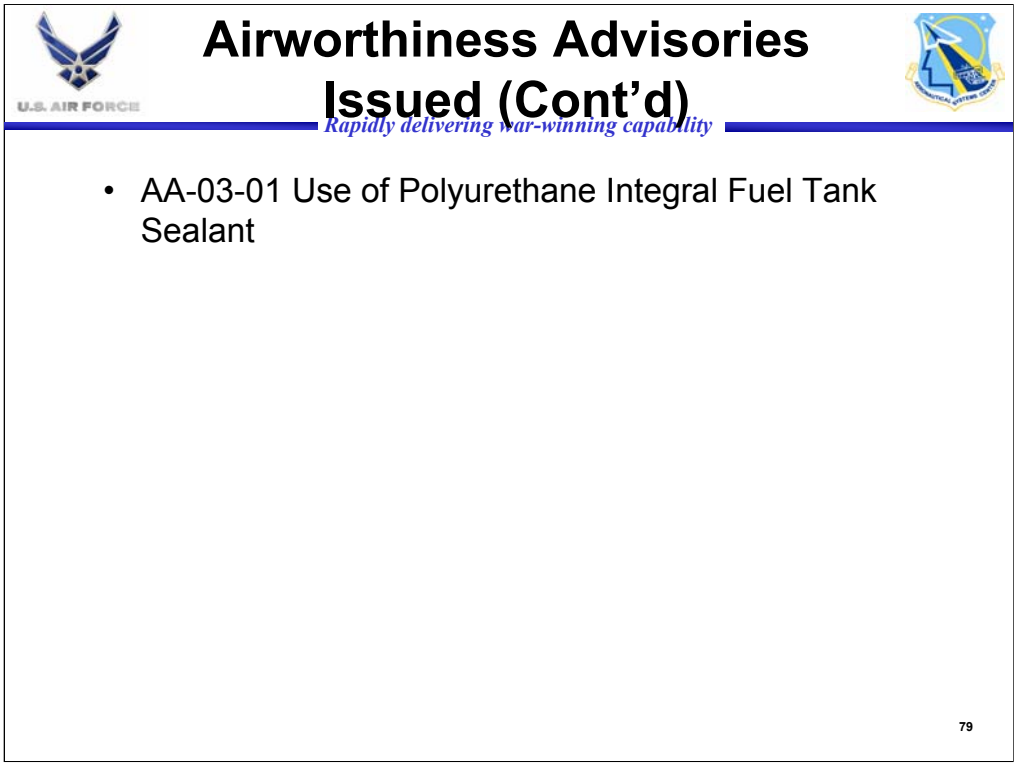
AA-01-02, 8 Mar 01 - Non-conforming/substandard aircraft control wire rope.

AA-01-03, 2 Apr 01 - Material and structural degradation can result when foot-and-mouth chemical disinfectants contact aircraft structures and subsystems.

AA-01-04, 4 Mar 02 - Structural issues associated with the use of Scuff-Sand & Solvent Wipe process for preparing metallic surfaces for adhesive bonded structural repairs.

AA-01-05, 10 Dec 01 - Use of aluminum oxide as the grit-blasting medium during the removal of organic coatings on USAF aircraft fuel tanks

AA-02-01, 28 Mar 02 - Potential safety hazards from defective or suspect FMS 800 Relay Switching Units (or similar devices) repaired by an FAA uncertified company.



AA-03-01, 13 Feb 03 - Provides information to assess and manage risks associated with the use of polyurethane integral fuel tank sealant.

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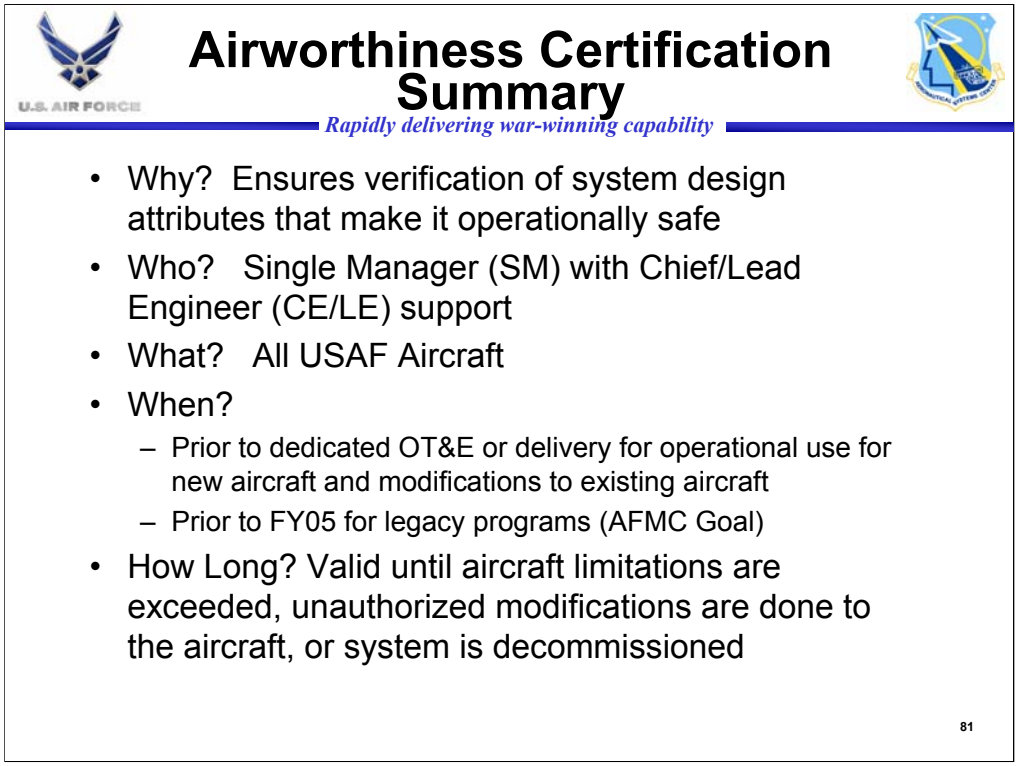


The main purpose of airworthiness certification is to verify that Air Force aircraft are safe to fly.

The Single Manager certifies airworthiness based on the compliance evidence provided by the Chief/Lead Engineer.

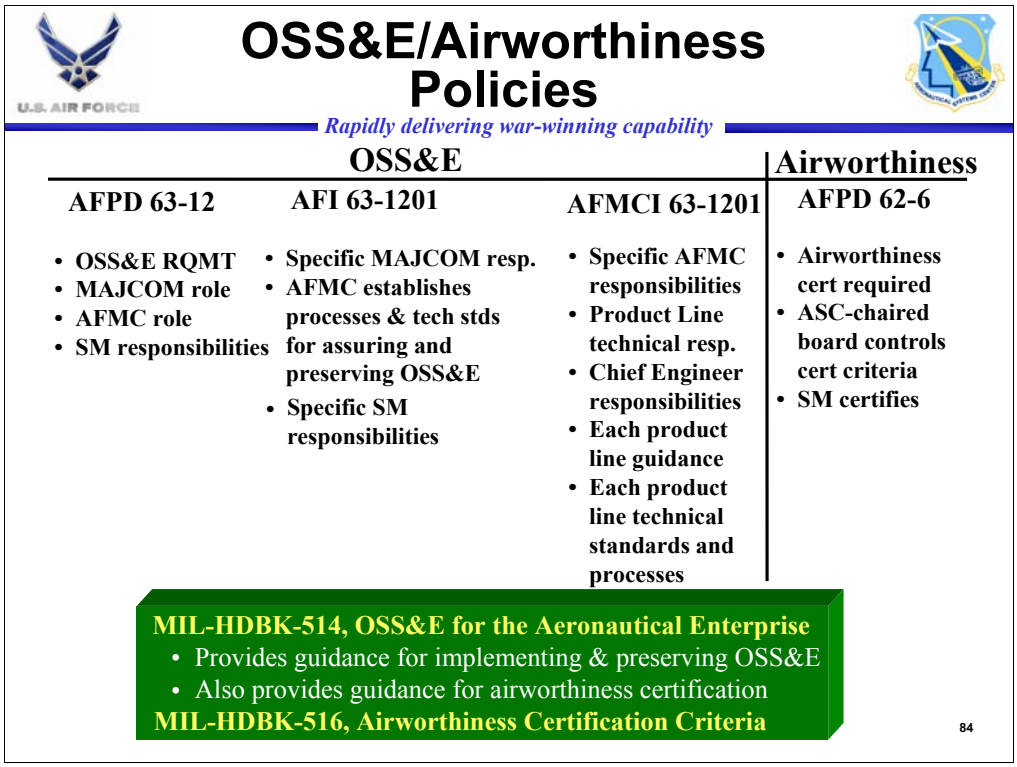
This policy applies to all Air Force aircraft, manned and unmanned, including Air Force Reserve and Air National Guard aircraft.

The intent of the AW certification timing is to ensure that a safe system is provided to the user, hence requiring AW certification prior to DOT&E when AFOTEC or the user accepts responsibility for test management. At this point aircraft systems transition from a controlled test environment with test pilots, etc., into an operational environment.

If there won't be DOT&E, AW certification must occur prior to the user taking responsibility for testing or operational usage.

The airworthiness certificate remains valid until the user operates the aircraft outside the limitations imposed by the technical manuals, unauthorized modifications are done to the aircraft (i.e., the aircraft's airworthiness is no longer certain), or the system is decommissioned.

Backup



Many people have mistakenly equated Operational Safety, Suitability, and Effectiveness (OSS&E) with airworthiness certification. Airworthiness is part of the safety component of OSS&E.

Airworthiness certification is only one of the many certifications that the SM must accomplish or obtain to assure OSS&E of his/her fleet (AFI 63-1201, para. 2.8.7).